The Journal of HEREDITY

A monthly publication devoted to Plant Breeding Animal Breeding and Eugenics

GENERAL LIBRARY
JAN - 7 1919
UNIV. OF MICH.

NOVEMBER, 1918

Vol. IX, No. 7

THE CHINESE PETSAI AS A SALAD
APPROACHING EXTINCTION OF MAYFLOWER DESCENDANTS
BUD-SPORT IN THE WASHINGTON NAVEL ORANGE
FRUITING OF APPLE TREES EVERY OTHER YEAR
ORANGE-LIKE FRUIT FROM A LEMON TREE
STANDARDIZED TESTS AND MENTAL INHERITANCE
A FRUITING ORANGE THORN
NATURAL CROSSING IN WHEAT

ORGAN OF THE
AMERICAN·GENETIC·ASSOCIATION
WASHINGTON · D.C.
Printed for Circulation among Members only

Acceptance for mailing at the special rate of postage provided for in section 1103, Act of October 3, 1917, authorized December 20, 1918.

WHAT GENETICS IS

"An exact determination of the laws of heredity," says William Bateson, "will probably work more change in man's outlook on the world, and in his power over nature, than any other advance in natural knowledge that can be clearly foreseen."

To gain this knowledge is the object of the science of genetics, which proceeds, in practice, largely by means of plant breeding and animal breeding for the reason that heredity is less complicated in these organisms than in Man, and its operation can be more easily made out. The knowledge so gained finds its application in methods for the improvement of cultivated plants and domesticated animals and, most important of all, in the improvement of the human race through the science of eugenics, which was defined by its founder, Francis Galton, as "the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally."

THE AMERICAN GENETIC ASSOCIATION

is an incorporated organization, coöperative in nature. It is devoted to promoting a knowledge of the laws of heredity and their application to the improvement of plants, animals, and human racial stocks.

It owns the JOURNAL OF HEREDITY, which is published monthly and sent free to each member.

REQUIREMENTS FOR MEMBERSHIP

Membership is composed of men of science, teachers, publicists, physicians, clergymen, parents, students, horticulturists and breeders of live stock, etc., throughout the world.

Subject to the approval of the council, any person interested in the improvement of the human race or the creation of better varieties of plants and animals, is eligible for membership.

The secretary will be glad to correspond with those interested, and to send a copy of the magazine for examination.

Annual dues, giving the right to attend all meetings and receive the JOURNAL OF HEREDITY, are $2; life membership is $50.

If you want to become a member, or if you know anyone who you think is eligible for membership, write to

THE AMERICAN GENETIC ASSOCIATION

P. O. Box No. 472, Eleventh Street Station Washington, D. C., U. S. A.

The

Journal of Heredity

(Formerly the American Breeders' Magazine)

Vol. IX, No. 7 November, 1918

CONTENTS

The Chinese Petsai as a Salad, by David Fairchild 291
Heredity of Stature in Man 295
Approaching Extinction of the Mayflower Descendants, by S. J. Holmes and C. M. Doud 296
Bud-sport in the Washington Navel Orange, by Robert W. Hodgson ... 301
Fighting Instinct Is Not the Warring Instinct, by Alleyne Ireland 303
Fruiting of Apple Trees Every Other Year, by B. S. Brown 304
Country Versus City Boys 306
Testing Pure-bred Cows in New South Wales 307
Orange-like Fruit from a Lemon Tree, by Thomas W. Brown 308
Standardized Tests and Mental Inheritance, by June E. Downey 311
A Fruiting Orange Thorn, by A. D. Shamel and C. S. Pomeroy, ... 316
Lemon Orchard from Buds of Single Selected Tree, by A. D. Shamel .. 319
How Sorghum Crosses Are Made, by T. E. Nafziger 321
Prolification in a Double Flower, by Peter Bisset 324
Natural Crossing in Wheat, by H. K. Hayes 326
Will Not Morality Necessarily Improve? by F. A. Woods 331
Fecundity in Domestic Fowl 333

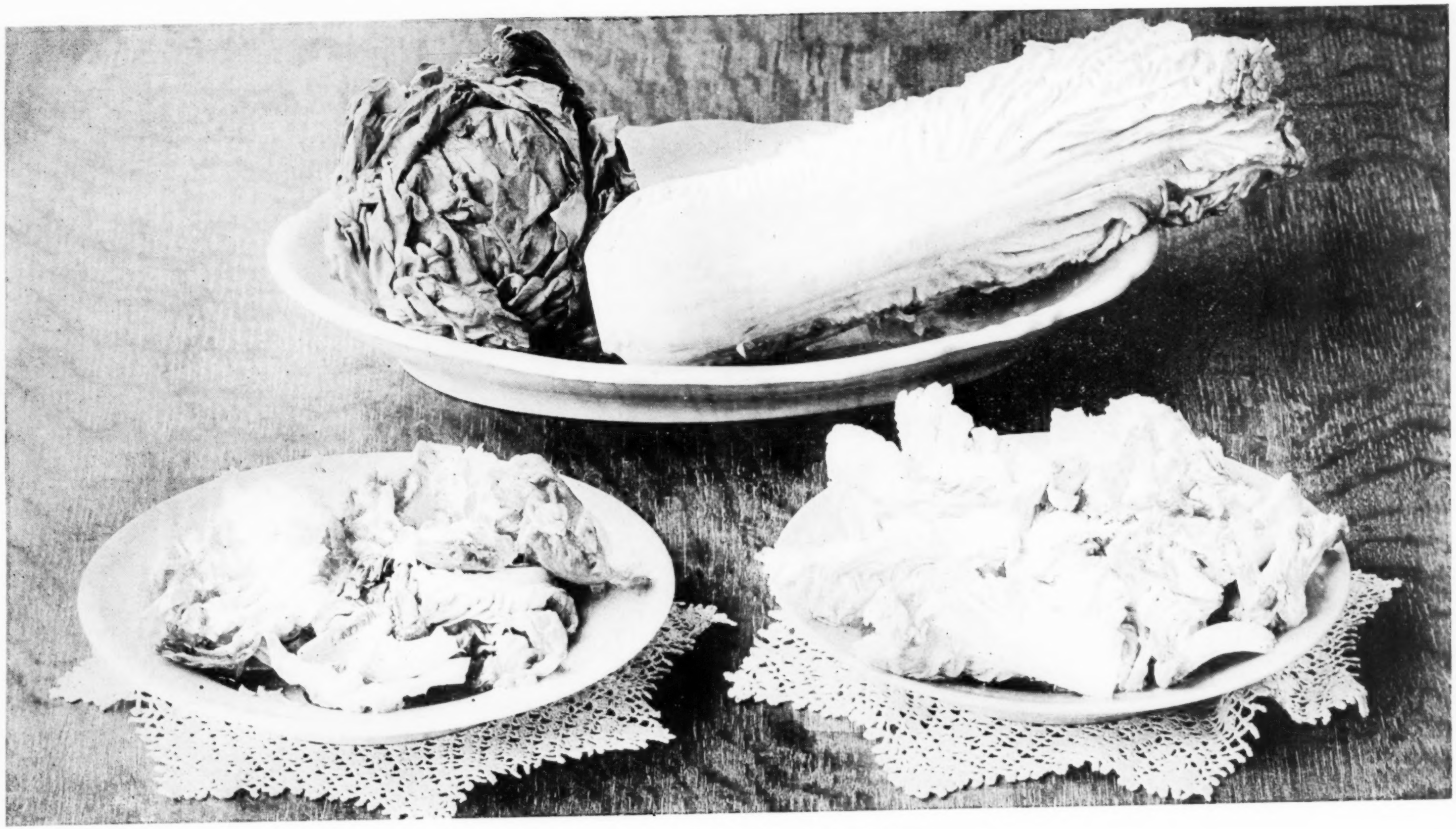
NOTE

Instead of raising the price of membership, and in order to meet the requirements of the War Industries Board, and also because of the drafting of the whole Editorial Staff the July, August and September numbers have been dropped out for 1918. Vol. IX will contain only 8 instead of 12 numbers.

The Journal of Heredity is published monthly with the exception of July, August and September by the American Genetic Association (formerly called the American Breeders' Association) for the benefit of its members. Canadian members who desire to receive it should send 25 cents a year, in addition to their regular membership dues of $2, because of additional postage on the magazine; foreign members pay 50 cents extra for the same reason. Subscription price to non-members, $2.00 a year, foreign postage extra; price of single copies, 25 cents.

Entered as second-class matter February 24, 1915, at the postoffice at Washington, D. C., under the act of August 24, 1912. Contents copyrighted 1918 by the American Genetic Association. Reproduction of articles or parts of articles permitted provided proper credit is given to author and to the Journal of Heredity (Organ of the American Genetic Association), Washington, D. C.

Date of issue of this number, December 12, 1918.



PETSAI AND LETTUCE COMPARED

In the upper plate is shown a head of lettuce at the left and a head of petsai at the right. In the lower plates are lettuce salad at the left, petsai salad at the right. (Frontispiece.)

THE CHINESE PETSAI AS A SALAD VEGETABLE

DAVID FAIRCHILD

Agricultural Explorer in Charge of Foreign Seed and Plant Introduction, U. S. Department of Agriculture, Washington, D. C.

IN THE most remarkable book which has been written on the agriculture of the Chinese ("Farmers of Forty Centuries"), Dr. King points out that the farmers of China, through a wide use of immature forms of vegetation as food, are able to produce an immense amount of food that would otherwise be impossible. These quick-growing leafy vegetables produce a crop of green leaves in a much shorter time than the plants whose seeds are eaten require to ripen a seed crop. This fact allows of the production of more crops and a larger amount of food, per year. Leafy vegetables are furthermore sown and matured in the early spring and the late fall when the hours of sunshine are too few each day to permit of the ripening of grain seed crops, that require a long period for development.

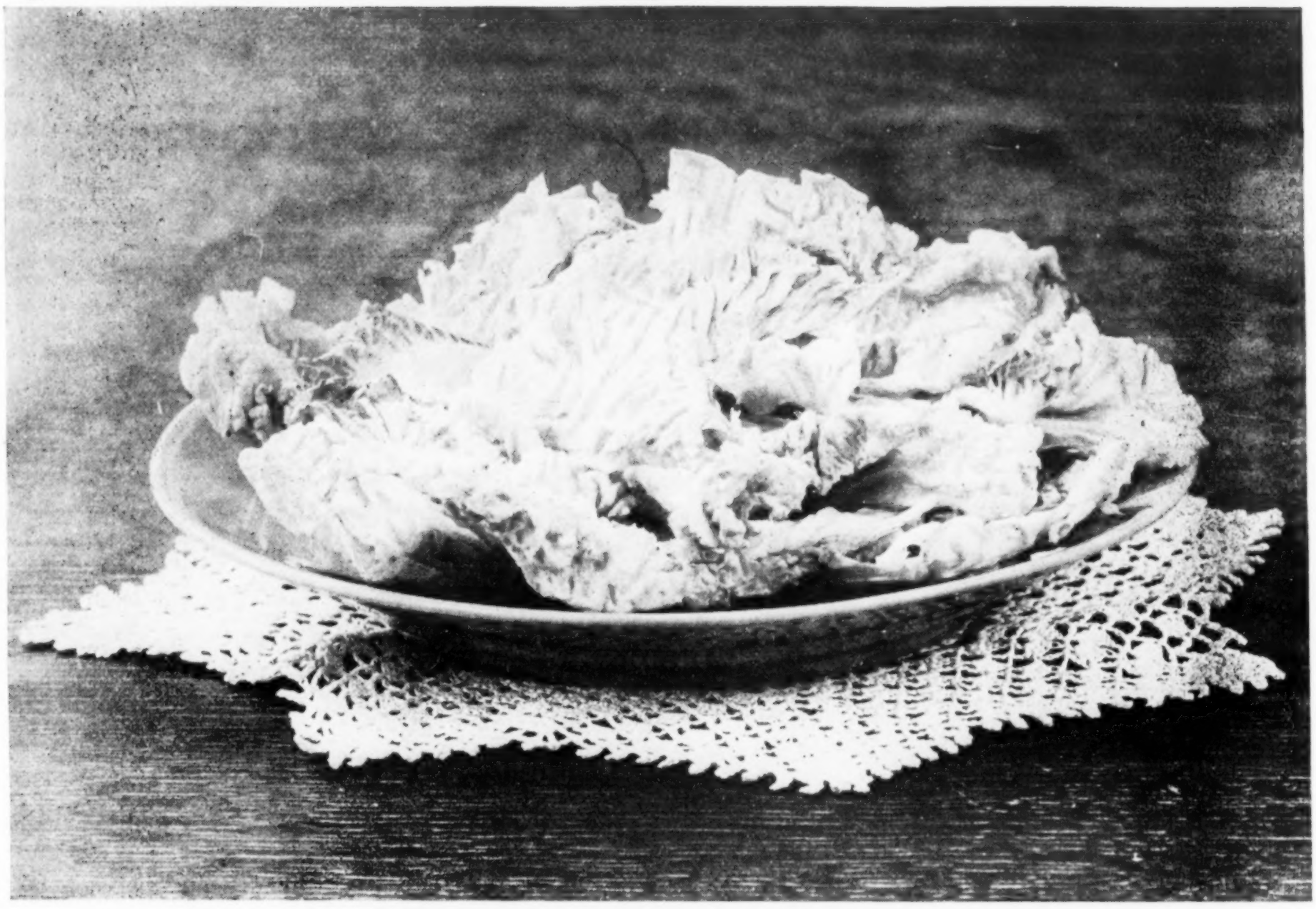
The recent discoveries of Dr. McCollum, of the Rockefeller Foundation, show that there is in the green leaves of plants the same substance which is found in butter and which he has designated "fat soluble A." This is one of the so-called vitamines and is as essential to the growth of the animal body as the carbohydrates, fats or proteins of meats, cereals, eggs, and vegetables. That animals cannot live and grow without this substance has given a new importance to the leaf vegetables in our dietary.

To Americans, lettuce has become the great salad vegetable, and throughout the year it is grown in some part or other of the country, and in the winter either shipped thousands of miles to our tables or grown under glass near our great cities at a considerable expense of coal; over 40,000 tons are so grown.

In the Chinese Petsai we have a rival of the lettuce in so far as any vegetable can rival another. It deserves at least to be given the serious consideration of Americans as a supplement of lettuce. It can be produced for about half the money. It can be grown everywhere throughout the country. It is a better keeper than lettuce and, pound for pound, it probably contains as much of the valuable substance for which we eat lettuce—the "fat soluble A." Furthermore, in appearance it is more attractive.

The question of a new vegetable is so tied up with our taste, and our taste is so dependent on the name, that the term "Chinese cabbage" should never have been given to this representative of the mustard family. Technically, it is not a cabbage, and why prejudice people against it who do not care for cabbage. It is hard for the average mind to believe that anything which has the name of cabbage attached to it could by any means possible be made into a rival of the delicate lettuce when dressed with a French salad dressing and eaten in the same way.

That petsai is a rival and that we should take it into our menu and make a place for it, there is no longer any doubt in my mind. The testimony of unprejudiced people who have tried it, and the fact that there are areas of the country where the same amount of this rival can be produced easier and more cheaply than can lettuce, are facts



A SALAD OF CHINESE PETSAI

In brilliancy and crispness and in keeping qualities the petsai is undoubtedly superior to the lettuce and it rivals lettuce in palatability. Furthermore, a seed crop requires several months of really warm weather to mature in, whereas a leafy vegetable can produce a crop of leaves in a few weeks of early spring and in the cool days of late fall. This economy is understood by the Chinese. (Fig. 1.)

which during these times ought to appeal to every patriotic citizen.

To insist that we shall be fed on the more expensive of the foods and to refuse to eat the easier produced ones is an attitude of mind at variance with the spirit of the day.

Where can we get the most food for the money and the best of its kind and of the kinds which will keep employed every acre of land and every unemployed farmer and his equipment, are questions which the consumer should ask himself.

Of course there is no question but that this country could, in the course of years, shift its agriculture to such a degree that it would be living and working on a small fraction of the cost which it now requires to feed it. Imagine the saving which a return to a millet diet, such as is still in use by the Chinese in Manchuria, would bring about. How long it would take to adapt our digestive tracts to such a diet it is hard to say, but no doubt it could be done.

There are certain kinds of economies which Americans in their handling of the food question can bring about, but there are others in which it is hard to imagine any great and immediate changes. In the growing of vegetables and the getting them into the hands of the consumers a degree of hand labor is absolutely necessary. If labor remains at $3 a day this item in the cost of production will not be decreased, and it is hard to see how the cost of lettuce to the consumer can be brought down so long as these prices for hand labor continue.

If, for the same amount of hand labor, double the amount of just as good a vegetable as lettuce can be produced, there is a direct saving which deserves to be seriously considered. The only thing which stands in the way is the fashion for lettuce—the fact that every-

body likes lettuce and few know petsai. The Germans brought themselves to eat over five hundred substitutes for the things which they were fond of before the war, and Americans must learn that they cannot continue to do their utmost to help the Allies and eat just the same things which they ate before. Now is the time to take stock of the cost of production and see whether there are not cheaper things to grow than some which our fondness for certain flavors has induced the farmer to produce.

The production of roast pig has already been brought under a scrutiny, and the cost of that roast pig is now well understood. The comparative costs of producing roast beef and mutton are facts of which the public is getting every day a clearer appreciation. But the cost of fruits and vegetables and their comparative food value is one which as yet has scarcely touched our consciences.

The largest truck grower in New Jersey and one of the most successful in America has grown the petsai for several years and declares that the cost of growing and marketing it is about half the cost of growing and marketing lettuce, but more than the cost of producing field cabbage. If he could get for petsai anything approaching what he can for the lettuce he would put in a large area of it next year and make a lot of money. What he would do the other truck growers would be willing to do, and there would need be no dearth of this delicious vegetable.

If he could get for it even considerably less than the prevailing price for lettuce he would make money and the consumer would save money by eating a salad which is, after all, quite as delicious as lettuce and just as nutritious. What stands in the way of this saving? The taste for lettuce, nothing more.

In China, where a few years ago a farm laborer received an equivalent of only $21 a year, the equivalent at that time of about two weeks' work of our farm labor, this particular vegetable is grown everywhere, and it can hardly be doubted that it is grown as much as a matter of economy as for any other reason. If the Chinese feel they must grow this cheaply produced vegetable to save labor that costs only $21 a year, how can we refuse to grow it for the same reasons under the stress of the war's demands—just because we are unaccustomed to it and do not think it will taste as good as the lettuce with which we are familiar.

It might be claimed that we could make a salad out of the ordinary cabbage, which would be good enough, and that since this is still easier grown than the Chinese cabbage we would be saving still more by the economy.. I doubt if this is practicable at the present time, for there are so many people who do not like cabbage—cannot eat it, in fact, without discomfort—that the number of people who would give up lettuce and eat cabbage would be nothing like half the number who would take up this new salad which has no cabbage flavor when properly prepared. The saving therefore would be greater in the substitution of this Chinese petsai than it would be in any attempt to substitute ordinary cabbage for lettuce.

How can this introduction be brought about? By starting a craze for the Chinese petsai. If the demand is created the growers will produce the vegetable. What they are afraid of is its overproduction and what the Government can do is to stimulate the consumption. If the latter is stimulated the production will take care of itself. This stimulation of consumption will benefit those who grow the petsai, it is true, but as anyone can grow it, there will be no unjust discrimination.

There is this further advantage in the introduction of a new vegetable as opposed to the substitution of an old one. Every vegetable has its optimum climatic and soil conditions; these are not likely to be the same for the Chinese petsai as they are for the other vegetables, and in the course of time we will find there are certain areas which because of their peculiar fitness to grow the petsai have become famous for the excellence of the heads produced. This is the case in China where for forty

centuries this vegetable has been grown, and there is no reason why it should not be the case in this country. It is only by the shifting of crops and the addition of new ones to our list that this country is to be completely farmed to that degree of perfection which will be necessary if we are ever to support the vast population which we expect to support.

Is the Chinese petsai worthy of this effort to establish it in our horticulture? Many testimonials of people who have eaten it and who are unprejudiced can be adduced to show that it is.

TESTIMONIALS

While it is undoubtedly true that it requires years to test a new vegetable and be sure that it will stand the test of continuous use, there are certain facts which make it seem probable that the introduction of the petsai can be accomplished in a reasonable length of time in this country.

The American is learning to eat many new things. He is in this respect in a stage advanced over that of the modern European. His menu is a hodge-podge already of the menus of Italy, France and England, with those of Russia, Greece, and Hungary thrown in. Ours is the melting pot of menus, so to speak, and into it have come in the last twenty years the grapefruit, the avocado, the ripe olive, the casaba melon, the honey-dew melon, the wild rice, the dasheen, the sand dab, the tile fish, the green asparagus, the endive or whitlof, the globe artichoke, the soy bean, the Japanese persimmon, the mango, and others.

The Chinese restaurant has become a factor in our cities and thousands of Americans have come to appreciate the new flavors and textures of foods which are served there. This petsai is one of the staple vegetables of the chop suey, and without knowing it many thousands of Americans have tasted and liked it and will continue to do so in increasing numbers as the years pass.

A vegetable which comes to us while we are in this formative state of mind regarding foods is not likely to be thrown out again if, like petsai, it has the great advantage of cheapness and has stood the test of centuries on the other side of the Pacific. We must not forget that nearly all of our plant foods have come to us one by one from foreign peoples and generally represent the discoveries of primitive peoples somewhere in the world. There seems to be a biological drift toward the enlargement of the menu of civilized man, and this drift is taken advantage of by the manufacturers of new foods who control their production.

Why should it be considered the wisest thing for the people in these matters of foods to be left to the influences of private salesmanship? Our food chemists know the approximate food value of most of the foods sold on our markets, but the people do not. And because they are ignorant the manufacturers of foods spend millions to teach them the value of their particular product. They make house to house visits by the thousand to demonstrate the use of some special food for which they charge often more than it is actually worth. The people have no way of finding out what it is really worth and they learn to like it and find it hard to do without. This habit, fixed by the skillful salesman, becomes the source of revenue to the manufacturer, regardless of whether a thousand calories of it cost the consumer three cents or ten cents.

On the other hand we have here in the Chinese petsai a product which is actually cheaper to produce, has presumably the same food value as lettuce, and because no food manufacturer can control its production with some trademark or patent, and because there is no advertising agency which can take it up and make a house to house canvass and teach people to eat it, years or even decades pass before, through the slow and tedious process of gradual popularization, it finally comes into our menu and stays there.

Supposing we take a conscious direc-

tion of these food habits into our hands, and, on the ground of chemical analyses and dietetic experiments carried out on rats and guinea-pigs and "poison squads" of men and women, determine the real value of these new foods; then by experiments on the farms find out the relative cost of growing them, the best places to grow them and the extension of territory which will result by their cultivation; then on the basic groundwork of sound knowledge conduct a campaign of publicity such as no food manufacturer even dares to conduct and plant the new food product in the minds of the people where it will remain until something better is discovered.

Heredity of Stature in Man

Dr. C. B. Davenport, Director of the Department of Experimental Evolution of the Carnegie Institution of Washington, in coöperation with the Eugenics Record Office, has completed a study of inheritance of human stature, which has been published in *Genetics*. "Stature has long been a classical object of investigation, largely because it is so readily measured. Thus, in 1889, Galton published his studies on stature in parents and children and their interrelation. This led to Professor Karl Pearson's remarkable series of investigations, 'Mathematical Contributions to the Theory of Evolution,' that founded the biometric school, which has left its imprint on biology, though it has proved disappointing in its assistance to the study of heredity. Though stature is the end-result of a number of independently varying elements, still, because of facts that determine growth as a whole, and because the length of the separate segments of stature are separately inheritable, it is possible to find some law of inheritance of the trait.

The present study was made on data derived from 3,298 children, their 1,738 parents, and a number of grandparents, uncles, and aunts. A large proportion of these were especially measured at their homes in various parts of the country. The hypothesis is supported that while short parents tend, on the average, to have short children, they may, and frequently do, carry germ-cells which lack the shortening factors; on the other hand, all of the children of tall parents are tall. Consequently the offspring of two very short or short parents are more variable in stature than the offspring of two very tall or tall parents as 2.4 is to 2.2. Also, whereas the offspring of two very short or short parents tend, on the average, to be less extreme than the parents, this is not true of the offspring of two very tall or tall parents.

Not only is stature as a whole inherited, but also, and even more clearly, each segment of stature, such as neck, length of torso, thigh, and foreleg; and the inheritance of the length of these segments follows the same law as does stature as a whole. An interesting by-product of this study is that persons of similar stature tend to marry each other, and the more extreme their stature the more particular are persons in this respect. Among 869 matings that of a very short man to a very tall woman occurred only once, or one-tenth the expected number of times, while the marriage of a very tall man to a very short woman did not occur at all."—*From the Annual Report of the Director*, 1917, pp. 128-129.

THE APPROACHING EXTINCTION OF THE MAYFLOWER DESCENDANTS

We Are Soon to Celebrate the 300th Anniversary of the Landing of the Pilgrims. If Their Present Birth Rate Continues for Another 300 Years, It Will Be Possible to Put All the Surviving Descendants Back Again Into the Mayflower, and No Overcrowding

S. J. Holmes and C. M. Doud
University of California, Berkeley, Cal.

THE data upon which this paper is based were obtained partly from a biographical study of Mayflower families, and partly from the results of a questionnaire sent to the members of the California branch of the Society of Mayflower Descendants. We are indebted to Mr. Herbert Folger, the historian of the California branch of this society, for a list of the names and addresses of members and for his kindly interest in our work. We wish also to thank the numerous Mayflower descendants who have taken the trouble to answer the questionnaire sent to them.

The questionnaires were furnished with spaces for filling in the desired data, which included the ages of husband and wife, date of marriage, number of children, including those stillborn, the number of children in the family of the father and mother of the Mayflower descendants, and a query concerning what may have seemed to many a mere matter of idle curiosity—the religion of both husband and wife. Data were also requested concerning the dates of marriage and number of children of any descendants of the present members.

The statement of religious affiliation was requested with a view of ascertaining what correlation might exist between the religious belief of parents and the size of their family. Families are unusually large in certain sects, such as Catholics and Jews, but our data were not sufficient to enable us to draw any conclusion as to the correlation between religion and fecundity in the group of people investigated.

Of the 241 questionnaires sent out, 116 were returned, but 10 of these were imperfectly filled out, so that they could not be used. Records were obtained sufficiently complete for our purpose from 106 families. It is hardly probable that incompleteness of returns would introduce any qualitative differences of importance in the data. Those having no children might be somewhat less apt to fill out and return the blanks; if so, the reduction in the size of the family would be somewhat greater than our records indicate.

We have grouped families according to the date of the birth of the parents. Most of our data concerns individuals born in the two 20-year intervals, 1840-1860 and 1860-1880. There are fewer records of the families of individuals born between 1820 and 1840, but these show a considerably higher birth rate than the families belonging to subsequent decades. The families of individuals born after 1880 cannot be considered complete, since more children may be born in them. Parents, both of whom were born between 1860 and 1880, may, in rare cases, produce more children,

but not enough to sensibly influence results. The youngest woman in this age group would be 38 years of age. There are, as a matter of fact, only eight women in this group under 45 years of age, and judging from the children born between the ages of 38 and 45 in our group, the additions to the race from this source will doubtless be very few. We have made separate tabulations of the number of children of parents, both of whom were born in the second half of this interval, i. e., 1870 to 1880, and it shows the startlingly low record of only 1 5/10 children per family.

DECLINE IS STEADY

The general decline in the size of the families of the Mayflower descendants is clearly indicated by the table (see appendix). The first horizontal column includes the number of children in the families of the Mayflower descendants to whom questionnaires were addressed. It shows that the decrease in the size of the family has gone on steadily with the decreasing age of the married couples down to the year 1880. The families of Mayflower descendants born after this date naturally show a further decrease, but as these families may not in all cases be completed, there is no means of knowing how much of this decrease may be due to a further decline of the birth rate.

In the second horizontal column is listed the number of children in the families of the mothers of the persons addressed, and in the third is a list of the number of children in the father's family. The numbers in both of these columns also show a declining birth rate. In general there are fewer children in the family of the mother than in that of the father. This is doubtless to be attributed to the fact that since mothers are, as the returns show in nearly every case, younger than the fathers, and often several years younger, they belong to rather more recent families than those of their husbands, and, therefore, to families in which the birth rate is more reduced.

It is well known that up to about a half century ago the Mayflower descendants were noteworthy on account of their high fertility, as is indicated by their very rapid increase in a few generations to many times their original number. An examination of the published genealogies of several of the Mayflower families shows the frequent occurrence of 8 to 10 children per family; and even larger families were by no means rare. In order to secure data on the fertility of this stock, before the period covered by our questionnaire, we have tabulated the average number of the children in the genealogy of the Brewster family, which has been compiled by Emma C. Brewster Jones. In this extensive work the data on the various families are grouped under the successive generations which have appeared since the landing of the Pilgrims. It was, therefore, a small task to compute the average size of the families in successive generations. As only those families are listed in which at least one child was born, the data is not strictly comparable to ours, which include sterile unions. Were the latter included, the average size of the families of the Brewster descendants would be somewhat reduced, although childless marriages were formerly less common in this stock than among present-day Mayflower descendants. The data, which were based on the comparison of several hundred families, show clearly the decline of the birth rate during the last three generations.

In our estimate of the average number of children per family, we have included all the families in the Brewster genealogy up to the eighth generation. For the two subsequent generations, on account of the large number of individuals recorded, we have based our estimate on the first two hundred families of the eighth generation, and the first three hundred of the ninth generation, and we have considered only those cases in which the ages of the parents insure that the family is a completed one.

The size of the families of the first three generations is obviously of little significance on account of the small number of individuals included. The numbers in the following generation rapidly increased. The fourth generation contains 23 families; the fifth, 52; the sixth, 121; the seventh, 275, showing that the number of fertile unions more than doubled in each generation. About the same rate of increase is shown by counting the total number of children of these families, which are as follows: Thirty in the third, 155 in the fourth, 359 in the fifth, 864 in the sixth, and 1,760 in the seventh generation. The average number of children per family in successive generations is shown in the table (see appendix).

The ninth generation comprises people whose parents lived for the most part in the first half of the nineteenth century. Their birth rate corresponds roughly to that of the parents of existing Mayflower descendants from whom we have received returns from our questionnaires.

DECLINE IS RECENT

The evidence from the two sources we have considered indicates that the birth rate has been falling more or less for the last 100 years, but the rate of fall has been more rapid in the latter half of this period. This is what one would expect in the light of the general decline of the birth rate, especially among people of fairly high social status.

It must be admitted that the members of the Society of Mayflower Descendants represent a more or less selected body of individuals, and that if all the descendants of the original band of Pilgrims were investigated, the average birth rate would be found to be somewhat higher. It is also possible that the birth rate among members of the California branch may be somewhat lower than it is among those residing in other states, but, however this may be, there is little likelihood that the birth rate of the entire group would come near being sufficient to insure the propagation of the stock without loss.

The results we have obtained are quite comparable to those of several other studies on the decline of the birth rate among people of American birth. The average family of the present Mayflower descendant is comparable in size to the families of the graduates of Harvard, Yale, and other universities and colleges, and to the families of American men of science studied by Cattell. These families average somewhere between 2 and 2 5/10 children per married couple, which is a somewhat better showing than is made by the modern descendants of the Pilgrim Fathers. In fact, the average family of American-born parents, judging from all the data that have been collected on the subject, contains somewhat less than three children. With our present birth rate and marriage rate, nearly four children per married couple are required to perpetuate the stock without loss. It is evident that the people who are of American lineage for more than two generations are not reproducing with sufficient rapidity to rescue their stock from ultimate extinction.

MAYFLOWER'S CAPACITY

The data we have collected on the birth rate of the Mayflower descendants point to but one conclusion. With the present rate of reproduction there must be going on a rapid diminution in the number of this once rapidly multiplying band. To judge from the evidence in our possession, their rate of multiplication is scarcely one-half what it should be to keep the stock even stationary. This means that four generations would affect a reduction to 1/16 of its present numbers, and that in four more generations there would be only one representative to every 256 at the present time. We shall soon celebrate the 300th anniversary of the landing of the Pilgrims, but if their present birth rate continues for another 300 years, it would probably be possible to put all the surviving descendants back again into the Mayflower without overcrowd-

ing the limited capacity of that celebrated vessel.

Considering the rôle which the Mayflower descendants have played in the history of our nation, this result is certainly one to be greatly deplored. If there is a remedy for this evil it can only become effective, I believe, if the evil is clearly recognized. The consensus of opinion among most of those who have studied the fall of the birth rate is that the chief factor involved is the voluntary restriction of the size of the family. In these days the obligation of obeying the primal behest to be fruitful and multiply, rests very lightly upon most people. I seriously doubt if the majority even of educated poeple have ever thought of how many children per married couple are required to perpetuate the race. How often one may hear it said glibly that one or two children per family is quite enough! Without discussing the probable reasons for this almost incredible ignorance and indifference concerning one of the most important and elementary matters of moral obligation, it is evident that we need a more widespread appreciation of the dangers of race suicide and a change of attitude in regard to this among people who are the bearers of good inheritance. Since human beings have come to regulate the matter of their own perpetuation, it is essential that they act with an intelligent appreciation of the racial consequences of their conduct, and not merely from the standpoint of their personal comfort and convenience. The consequence of the reduction in the fecundity of those classes who are successful in reaching a fair educational standard and in attaining a modest degree of financial competence is to recruit the race mainly from ranks below mediocrity. The racial deterioration which would thus be entailed cannot be checked by limiting the propagation of mental defectives. A society in which those with superior inheritance do not perpetuate their stock will eventually suffer racial decay. Anyone who studies the present condition of the differential birth rate cannot escape the conclusion that this is precisely the condition in which our present generation in America finds itself, and there is no remedy for this situation that does not involve the increase of the birth rate among those of good inheritance, at least to the point necessary to perpetuate their stock.

It would be a task eminently appropriate for the Society of Mayflower Descendants to consider the problem of the ways and means by which it may rescue itself from extinction. Here is a field for really worthy endeavor, infinitely more valuable than tracing family histories or celebrating the achievements of one's ancestors. It is time now to look to the future rather than to the past. Should the Mayflower descendants succeed, in any degree, towards solving the problem of avoiding extinction, it will not only be a direct service to the country, but one of possibly much greater value through the influence of its example. The problem facing the Mayflower descendants is, of course, the same that, in our modern world, faces people who have risen to a higher social status. It can be solved, I believe, only by the effective dissemination of a sense of racial obligation. What keeps the population of civilized countries on the increase is a combination of various forces: ignorance, lack of prudence, religion, love of children, the economic value of children, and a sense of racial duty, etc. A stock tends to rise or fall, according to which of these forces predominate. Where ignorance and lack of restraint are the principal causes of differential fecundity, a people tends to be recruited mainly from its inferior strains. Where the higher incentives to fecundity prevail, the race tends to be replenished more from those capable of responding to such motives. The economic value of the child no longer affords a stimulus to family increase, and religion, while still influential in some sects, has largely ceased to make itself effective among Protes-

tants[1] and free thinkers. The mass of cultivated people at present persuade themselves that family limitation is a justifiable procedure, especially in a well populated country, but while they may be right in avoiding the burden of the large families of ten or twelve, which were not infrequently found among our Puritan ancestors, they are certainly not justified in carrying the restriction to the present extreme, which, if continued, would effectively dispose of their stock in a few generations. When they thoroughly appreciate this fact, as they do not at the present time, will they respond to the call?

Rehabilitation of Our Wounded

The United States Government is resolved to do its best to restore every wounded American soldier and sailor to health, strength, and self-supporting activity.

Until his discharge from the hospital all the medical and surgical treatment necessary to restore him to health is under the jurisdiction of the military or naval authorities, according to the branch of the service he is in. The vocational training, the reëducation and rehabilitation necessary to restore him to self-supporting activity, is under the jurisdiction of the Federal Board for Vocational Education.

If he needs an artificial limb or mechanical appliance, the Government will supply it free, will keep it in repair, and renew it when necessary. If, after his discharge, he again needs medical treatment on account of his disability, the Government will supply it free. While he is in the hospital and while in training afterwards the soldier or sailor will receive compensation as if in service and his family or dependents will receive their allotment.

A wounded soldier or sailor, although his disability does not prevent him from returning to employment without training, can take a course of vocational training free of cost, and the compensation provided by the War Risk Insurance Act will be paid to him and the training will be free, but no allotment will be paid to his family.

Every Liberty Bond holder who holds his bond is keeping up a part of this great work of restoring to health, strength, and usefulness the men who have suffered for their country.—*Treasury Department, Bureau of Publicity.*

Utah Experiment Station Aids Farmers in War Against Ground Squirrels

That war is declared against ground squirrels and other rodent pests in Utah is evidenced by the recent appearance of Utah Experiment Station Circular No. 29, "The Control of Rodent Pests," which is being rapidly distributed throughout the State.

The circular was prepared by Mr. Charles J. Sorenson, Instructor in Zoology at the Utah Agricultural College. The publication contains the latest and best methods for killing ground squirrels, pocket gophers, jack rabbits, and field mice, four groups of rodent pests which it is estimated cause an annual loss of not less than $2,000,000 to the farm crops of Utah.

Early spring is the best time of all the year in which to wage war against ground squirrels. It is then that the animals emerge from their winter's hibernation, lean and hungry. Their natural food is scarce, and as a consequence the animals will eat poisoned baits more readily than at other times when green food is abundant.

---

[1] See an interesting article by M. Booth on Religious Belief as Affecting the Growth of Population, in the *Hibbert Journal,* 13, pp. 138-154, 1914.

AN INTERESTING BUD-SPORT IN THE WASHINGTON NAVEL ORANGE

Of Our Commercial Varieties of Oranges, None Is More Erratic and Prone to the Production of Sports than the Washington Navel

ROBERT W. HODGSON, *University of California*

THE work of Mr. A. D. Shamel and others has called attention to the frequency with which bud-sports are found in Citrus and has indicated the importance of bud selection in the maintenance of our standard varieties. There is little doubt but that the genus Citrus represents one of our most unstable classes of commercial fruits, and this tendency to the production of bud-sports or mutations is apparently heightened by environmental conditions in California. Of our commercial varieties of oranges, none is more erratic and prone to the production of sports than the Washington Navel. Thus in the fifty years we have known this variety, there have appeared no less than six additional well defined strains of more or less commercial importance, namely, the Australian or Florida navel, the Navelencia, Golden Buckeye, Golden Nuggett, Thomson's Improved and Smith's Willow Leaf. Many others have doubtless occurred, but being decidedly inferior to the original strain, have not been propagated and still others exist in individual trees, but have not been recognized by growers.

The characters involved in the mutations are not always of a visible nature, but may be qualities such as "yield," or time of maturity, or acid-sugar ratio, and it is, of course, characters such as these that are of the greatest importance from the commercial standpoint. Mr. Shamel has devised what he calls the performance record to indicate trees possessing the quality of high yield, and the best of such trees are selected as "mother" trees from which buds are cut for propagation purposes. The principal objection to the performance record is that it fails to indicate mutating trees. Thus a tree may have several sport limbs and be decidedly unsatisfactory for the selection of bud wood and still yield relatively high, which condition is in no way indicated from the performance record sheet.

The writer recently ran across such a tree, in an orchard near Riverside, possessing a single limb quite unlike the remainder of the tree. The vigor and habit of growth of this branch, the leaf shape and color, and the quality and form of the fruit are very different from the rest of the tree. The sport limb occurs rather high up in the tree and toward the end of what was apparrently a typical fruiting branch. At the point where the mutation took place the branch increases in diameter. The mutant limb has a greatly increased vigor of growth over the parent strain, as indicated by the increase in size of the stem as well as by the large, vigorous leaves, and an abnormal amount of fine twiggy growth. This vigor is also evidenced by the fact that the sport branch has acted as a sucker and has succeeded in starving the growth on the parent limb behind the point where the mutation occurred. All of this growth has died back, apparently from lack of nourishment. Indeed, the general effect of the limb on the tree has been of such a nature that the owner thought it was a mistletoe. (Fig. 2.)

The habit of growth is markedly weeping, the limb drooping until it touches the ground, although it originates at a height of seven feet or more. The branches are long and slender and

MUTATION IN THE WASHINGTON NAVEL ORANGE

Showing marked weeping habit of bud-sport. The owner thought this limb was a species of mistletoe. At the point where the mutation took place the branch increased in diameter. The mutant limb has greatly increased vigor of growth over the parent strain, as indicated by the increase in size of the stem, as well as by the large vigorous leaves. (Fig. 2.)

willowy in nature. (See Fig. 2.) The leaves are somewhat larger and decidedly longer than typical Washington Navel leaves and are a lighter green in color. The fruit is very coarse and irregular, with a tendency toward obtuse-pyriform shape, and pale yellow in color, in marked contrast to the rich orange of the navel. The quality is very inferior.

The striking appearance of this limb would no doubt deter a budder from cutting bud-wood from it, but as mentioned above, not all bud-sports are as visible as this. This fact emphasizes the desirability of a grower going over his trees very carefully when they are in fruit, for several seasons, before selecting "mother trees" from which to take bud-wood. It is not enough that the tree bear large crops, but every limb must be of the same strain and yield heavily, uniformly with fruit of good quality. Even the bud-wood should be selected only from limbs which are actually carrying fruit.

Fighting Instinct is Not the Warring Instinct

Mr. Paul Popenoe's interesting article in the October number of the JOURNAL OF HEREDITY, entitled "Is War Necessary?" suggests two points in regard to which the biology of the question appears to call for some further discussion.

1. Is not the fighting instinct something very different from the warring instinct?

The fighting instinct, that is to say, the instinct for personal combat, is an individual trait, finding an individual expression, as, for instance, in the "bad" man of the early mining camps. This instinct, having a very low survival value in a modern civilized environment, is probably disappearing under the pressure of a gradual elimination of the males in which it is strongly developed.

The warring instinct, on the other hand, is a group phenomenon, and is simply one phase of the instinct of gregariousness. As such it has a high survival value in the conflict between human groups; and it is not subject to an eliminating pressure. It is a mistake to suppose that the warring instinct is weakened by long periods of peace. In order that this effect should appear, we should have to accept the inheritance of traits acquired from the environment, a theory to which the opinion of biologists is almost universally opposed.

2. Is it a fact that "The argument that war is beneficial because it allows the fittest to survive . . . is now almost universally known to be fallacious?"

These questions are discussed at some length in the Introduction to Dr. Frederick Adams Woods' stimulating and suggestive volume entitled "Is War Diminishing?"

After pointing out that in actual warfare those who survive hardship and disease must be stronger than those who succumb, and that superior cunning and resourcefulness must also have a survival value, Dr. Woods says:

"If it be admitted that intelligence is a factor at all, then the more intelligent must themselves tend to escape, from the mere fact that they tend to do more of the killing. If strength and intelligence are of any value in a bayonet charge, then just so far as they tend to the killing of opponents so they must tend to the survival of their possessors. With artillery, indirect fire, telephones, wireless, and modern machine guns, intelligence must count for a good deal in the successful destruction of the enemy. Then it counts that much toward the survival of those who do the destroying."

It would appear to be a matter of importance that the points here raised should receive a full scientific discussion at this time. A symposium on the subject conducted by the JOURNAL OF HEREDITY would be of the utmost value.

ALLEYNE IRELAND,
St. Botolph Club, Boston, Mass.

FRUITING OF APPLE TREES EVERY OTHER YEAR

Reasons Why Apple Trees Bear Heavy Crops Every Other Year—Illustration of a Gravenstein Graft Alternating with the Original Tree

B. S. Brown

Head of the Horticultural Department, University of Maine, Orono, Me.

MANY varieties of apples and pears for various reasons bear only every other year. This condition is not uniform the country over, but is more common in the fruit sections of the North and East than in the South or West. The same is true but to a less extent of the stone fruits. The causes are somewhat varied but are mostly the result of the climatic environment in which the trees are grown. The biennial bearing habit is apparently not an inheritable trait, but when it once becomes fixed in the life of the individual there is little that can be done to change it.

In the fruit sections where the climatic conditions favor the setting of a crop every year, the biennial habit does not exist. In those sections where frosts and rains interfere with the set of fruit, the life processes of the tree are thrown out of balance and the tree gets into the habit of over-working one year and recuperating the next. A normal tree develops fruit buds for the next year at the same time it is maturing the present crop. When there is no fruit to mature, an over supply of fruit buds is prepared for the next year. When the time comes, if conditions are favorable, a heavy crop sets and the tree puts forth all its efforts to mature it. This causes such a heavy drain upon the energy of the tree, that no fruit buds are formed for the next crop. After a few years the habit generally becomes fixed and the tree continues as a biennial bearer.

If the trees are properly pruned and the fruit thinned, while they are young the habit can be prevented to a large extent. When a heavy crop sets on a young tree, it should be thinned enough so it will not be overburdened and can develop fruit buds while maturing the crop. If frost destroys the blossoms, then the grower should reduce the vigor of the trees by cropping the orchard or by giving less cultivation. A heavy pruning in the years when a crop is expected will tend to reduce the amount of fruit and increase the wood growth. Early summer pruning during the crop year will often stimulate fruit buds. As the trees grow older the habit becomes fixed and it is hardly worth while to attempt to correct it.

That a heavy crop actually reduces the number of blossoms formed for the next year can readily be proved by observing and counting those that appear through two or three years. Instances are not uncommon, where scarcely a dozen blossoms developed on trees that matured a heavy crop of fruit the preceding year. In the particular case illustrated in the accompanying photograph, one-half of the tree had been grafted to a gravenstein while the other half was of the original variety. For some unaccountable reason each half of the tree chose opposite years for their heavy crop. In the spring it presents an odd appearance by one-half being in heavy bloom while the other half scarcely develops a single blossom. The next year the process is reversed.

This tree is now about 25 years old and to the writer's personal knowledge has behaved as described for

GRAVENSTEIN APPLE GRAFT ON A RUSSIAN TYPE

The arrow marks the point of union. This year the Gravenstein branch is loaded with blossoms while the rest of the tree is comparatively bare. On alternate years these conditions are reversed. (Fig. 3.)

the past five years. No certain explanation as to the original cause of the condition can be given. As there is some slight difference in the blooming time of the two halves, it is possible, that frost may have come at such a time as to destroy the fruit on one side while the other escaped. It is interesting for two reasons. First, that it indicates that the formation of fruit buds is not wholly a question of nutrition. Second, that the food supply of the tree is directed *first* to the needs of the maturing crop.

Country Versus City Boys—A Difference in Environment Shown to Be Without Effect on General Health

Professor O. C. Glaser of the University of Michigan calls attention[1] to an interesting comparison made from army statistics between the physical fitness of our city boys and those from the country districts:

"In order to determine whether the average of physical soundness is higher among country boys than among city boys, the following comparison was made: Selection was made of a typical set of cities of 40,000 to 500,000 population, with no large immigrant element, and distributed over ten different states (Alabama, Arkansas, California, Colorado, Kansas, Montana, Nebraska, New York, and South Carolina) and a corresponding set of counties of the same total size, located in the same states and containing no city of 30,000, the total number of registrants in the two areas being 315,000. The result of the comparison was as follows: Of 35,017 registrants in urban areas, 9,969 were rejected; of 44,462 registrants in rural areas, 12,543 were rejected, or 28.47% of the city boys and 27.96% of the country boys. The result, therefore, was practically a tie, showing that the country boy does not possess a greater degree of the physical soundness necessary for his acceptance as a soldier."

This is in a way an experiment in heredity. The science of eugenics should include experimental tests as to any measurable effects produced by a change in the environment. Such changes are technically known as "modifications." If two populations have the same average heredity and are subjected to diverse environments, any changes noted may be presumably referred to the actions of the differing environments. Two distinct populations can however rarely have the same heredity. Selections acting through migrations and through survival of the fittest make the inborn qualities of different populations necessarily dissimilar. Some forces in city life must have been favorable to the health of its growing manhood, some unfavorable; and the same may be said for life in the country. It might have been thought that, on the whole, the advantages of fresher air and a more simple routine would have shown itself in this test, and that the country boys would have won. These results do not of course mean that it is not a good idea, when one is ill or run down, to take a trip to the country. In many ways the change wrought upon the individual is immediate and lasting. What these figures do show is this—that there are and have been a great many diverse and complex factors back of our present civilization, our supposedly artificial, commercial or city life and that many of these must have been beneficial to our citizens. Here at least is a definite difference of environment unable to show a measurable modification.

In connection with question of physique a few additional comments may throw some light upon the matter. It has been found that city boys are more likely than country boys to reach, in after life, a high level of intellectual

[1] *Good Health*, August, 2, 1918, p. 463.

distinction.[2] This is probably in part due to superior urban opportunity, but no one knows whether the disadvantages may not outweigh the advantages. Whatever be the causes of the phenomenon it is certainly a fact in accordance with mental inheritance since it is perfectly well recognized that talented youth longs for the life of the metropolis and naturally migrates cityward, and this inflow improves the quality of urban germ plasm.

Also, whether they marry in the country or marry in the city, the wives of these young men, who become the mothers of the next generation, are probably above the average in mentality; and this also works, as far as mental standards are concerned, to the advantage of the urban and to the detriment of the rural districts. The expectation that the wives will be similar to their husbands rests upon statistical investigations, which prove that there is a tendency for like to mate with like.[3] The principle is spoken of as assortative mating. Whether it be stature, eye color, hair color, longevity, insanity, general health, truthfulness or intelligence, exact measurements show that a man and his wife, though not related by blood, actually resemble each other as much as do uncle and niece or first cousins. Also we may add that physical superiority is correlated with mental superiority, so here is another explanation of why our city registrants made such a good showing in these recent army statistics.

The Testing of Pure-Bred Cows in New South Wales

A stud dairy sire should be pure-bred, of good type and constitution, but not every pure-bred sire is descended from ancestresses that were capable of yielding large quantities of milk and butter-fat, and, further, not all are capable of getting stock that possess these dairy qualities. These productive traits are hereditary, and one of the principal things expected from the testing of our stud stock is the defining of those families in which this factor is strong and dominant. So far, with only four years' records to refer to, our quest in this direction is limited, but the knowledge already in our possession encourages the hope that with the continuance of testing these families will be as well known in a few more years as those from which spring our famous race-horses. When this is established the dairy herds, not only of this State but of Australasia, can be bred up on proper production lines, and the prospect of their yields being doubled brought much nearer realization.

REVIEW OF THE YEAR'S WORK

The figures for the work of previous years have been taken from the annual reports of the Department of Agriculture, of New South Wales, which are made up to the 30th June of each year. The following tables for twelve months ended 30th June, 1916 and 1917 respectively, will show how those two periods compare (see appendix).

It will be seen from the foregoing that increased productiveness was made in all cases, except that of the milking shorthorn, which breed showed a very slight decrease. The average increase was 65 pound butter (20%) and 2,032 pound milk (25.5%). While the number of cows undergoing test was greater in 1917 by sixty-four, the number to complete the 273 days period was less by thirty than at the 30th June, 1916. —L. T. MacInnes, in *Farmers Bulletin* No. 117, Department of Agriculture, New South Wales.

---

[2] See Woods, Frederick Adams, *Science*, April 9 and July 2, 1909.
[3] See Popenoe, Paul, *Applied Eugenics*, N. Y., 1918, p. 126 and Chapter XI.

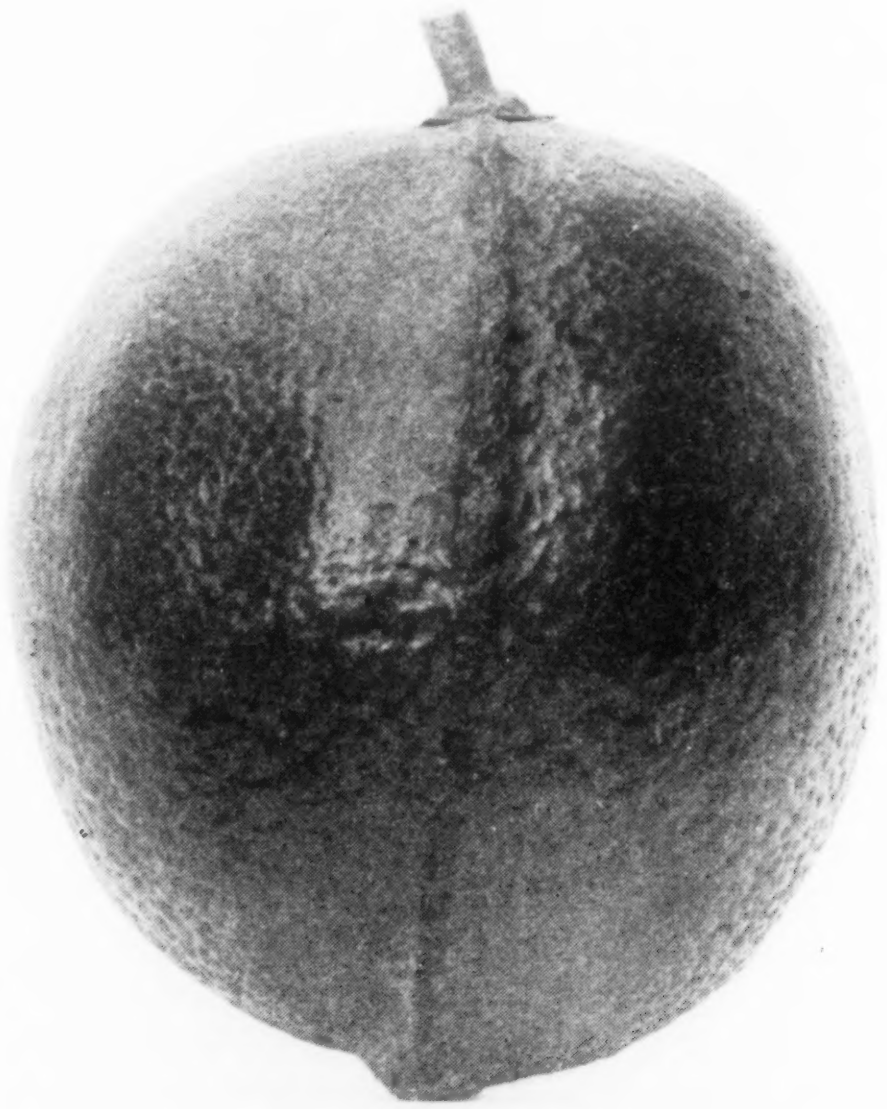
ORANGE LIKE FRUIT FROM A LEMON TREE

GIZA MUDIRIEH, EGYPT,
May 20, 1918.

DEAR SIR:

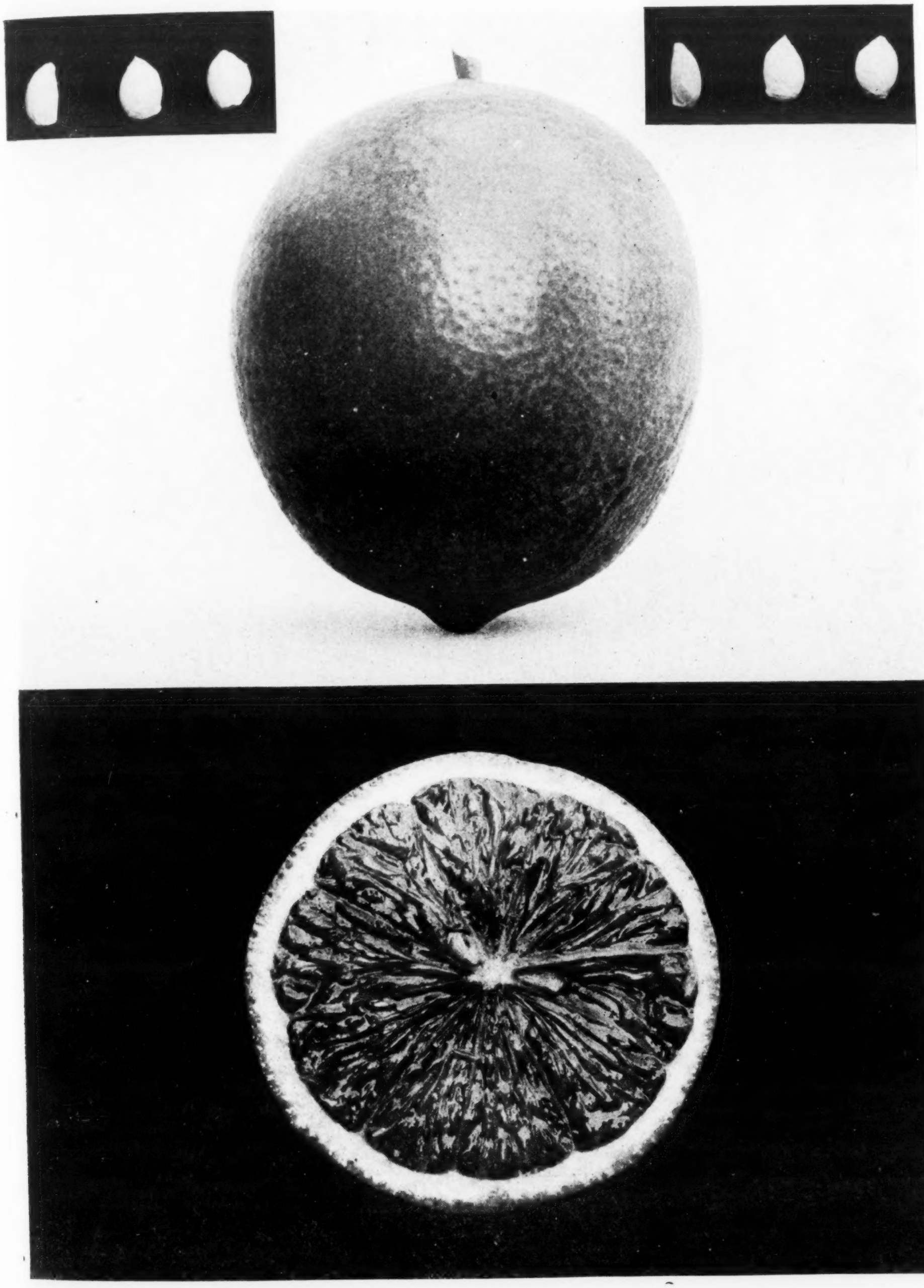
I enclose herewith three photographs of fruit taken from one tree. The tree was received from Italy and planted in the gardens of the Ministry of Agriculture at Giza, Cairo. It was supposed to be a typical Italian lemon. In the spring of 1917, it bore an excellent crop of fruit. Instead of the fruit being that of the ordinary lemon, it proved to be more spherical in shape, as shown in Fig. 5. The color of the fruits was that of a lemon, but many of them were characterized by a raised longitudinal orange-colored line on one side. This is shown in Fig. 4. Upon one of the branches appeared a large fruit which resembled a large orange in appearance and in taste. This is shown in Fig. 6. There is no question of the branch which bore the orange fruit having arisen from an additional graft. Several twigs of the same branch bore lemon fruits, such as those shown in Figs. 4 and 5. The tree itself is a grafted tree, but evidently the buds employed in its propagation had been taken from a hybrid tree between an orange and a lemon. I send this information in case it is of interest to you.

Yours faithfully,
THOS. W. BROWN.



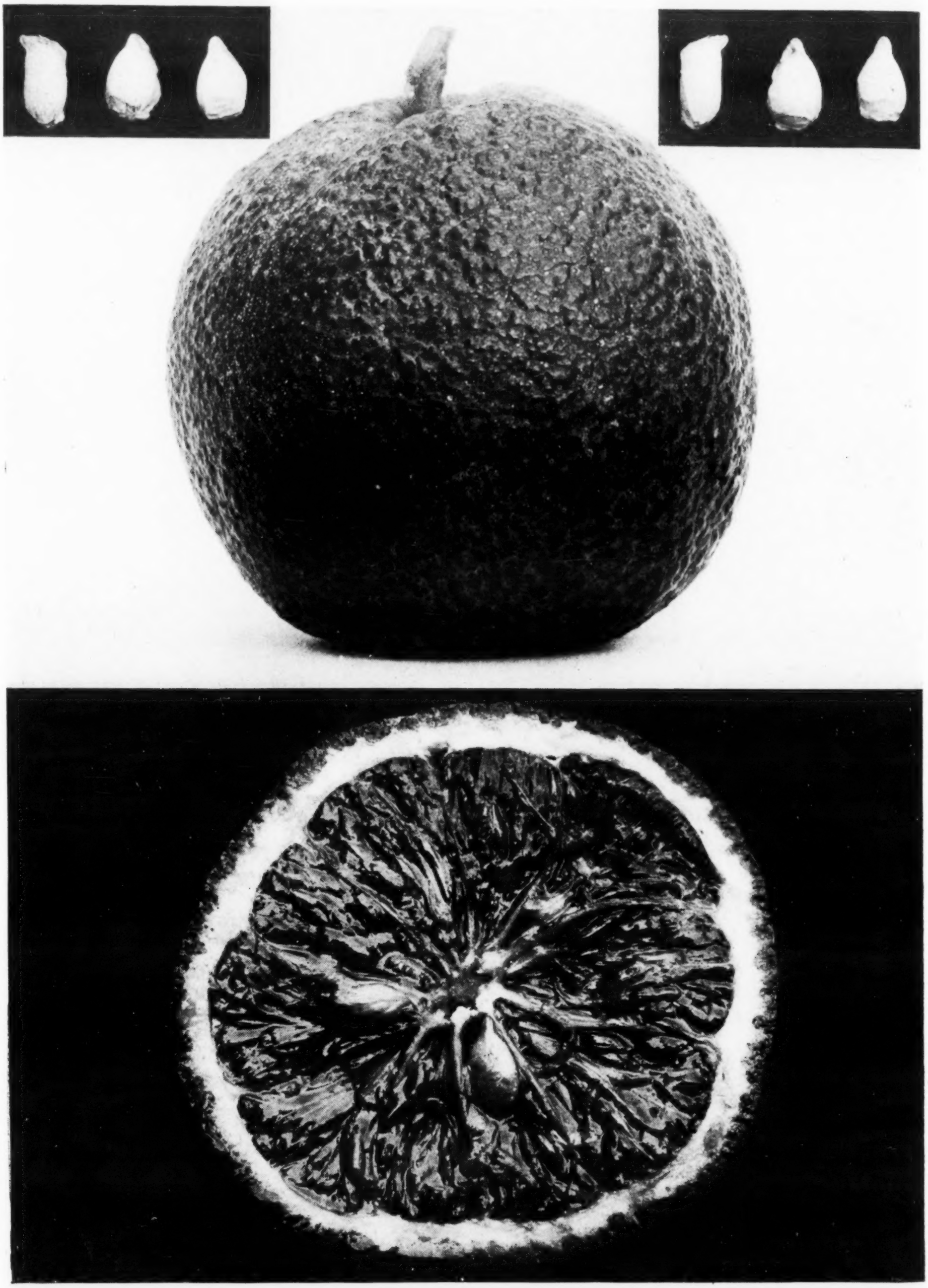
FRUIT GROWN ON A TREE SUPPOSED TO BE A LEMON

Raised orange-colored line on one side longitudinal to the fruit. (Fig. 4.)



PECULIAR LEMON IN PART RESEMBLING AN ORANGE

The color was that of a lemon, but the fruit had a more rounded contour. Grown in the gardens of the Minister of Agriculture at Giza, Cairo, on a tree supposed to be a typical Italian lemon. (Fig. 5.)



ORANGE IN TASTE AND APPEARANCE

Grown in the gardens of the Minister of Agriculture at Giza, Cairo, on a tree supposed to be a typical Italian lemor. (Fig. 6.)

STANDARDIZED TESTS AND MENTAL INHERITANCE

Very Young Children Already Show Great Variation in Special Aptitudes—These Differences Are Probably Not to Be Accounted for by Differences in Environment—More Tests Needed

JUNE E. DOWNEY, PH.D.

Professor of Psychology, University of Wyoming, Laramie, Wyoming

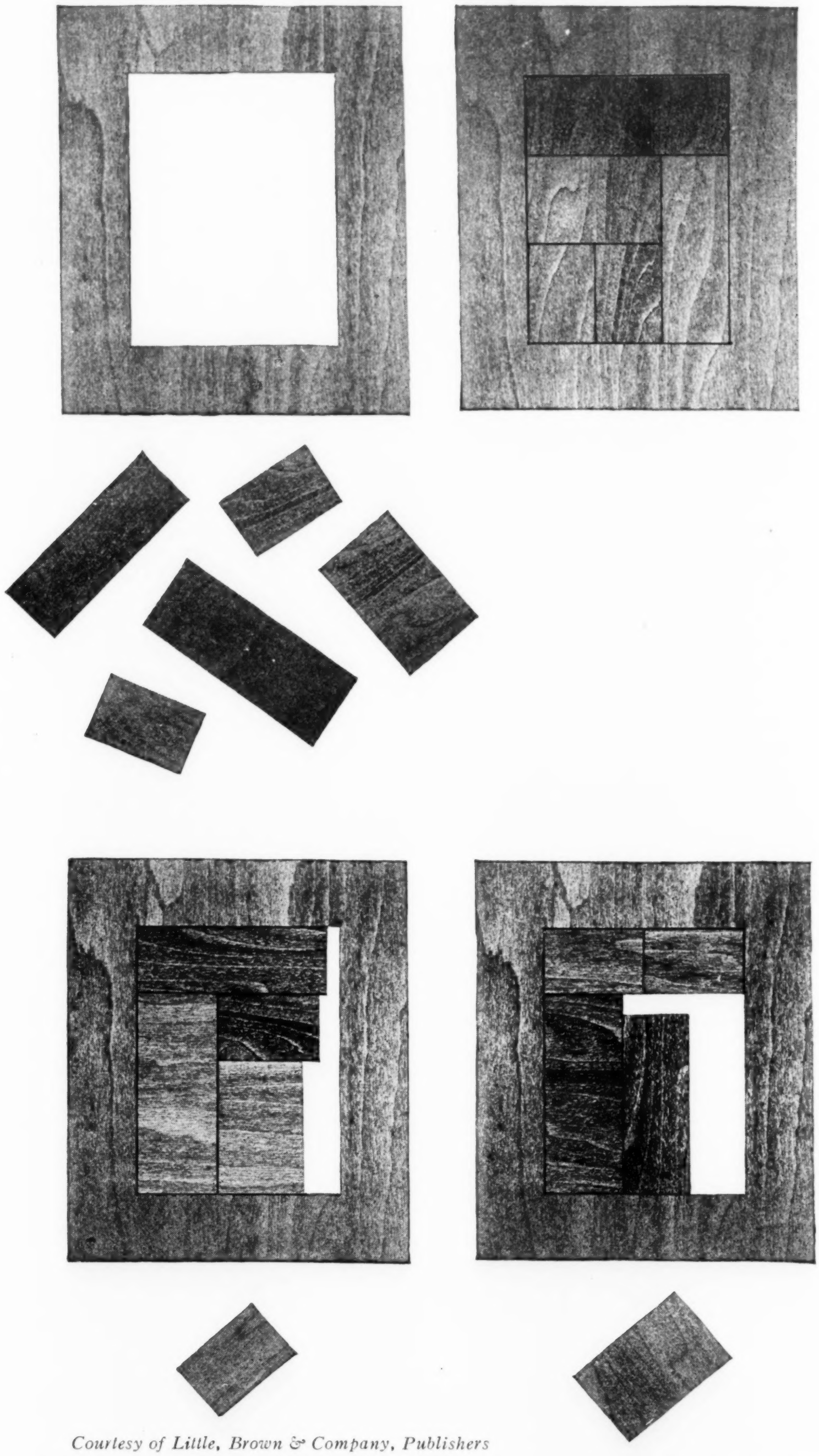
THE development by psychology of standardized tests of mental capacity and the establishment of norms of performance for different ages has, among its other possibilities, opened the way for exact studies of mental inheritance. Goddard's utilization of the Binet Scale of Intelligence in establishing the heritableness of feeble-mindedness as a Mendelian recessive is but the first breaking of ground. Other suggestions of profitable investigation crowd upon the attention. For instance, the possible identification, by help of the scales, of carriers of mental defects and pure normals. Probably these two types will show significant differences in their reactions to standardized mental tests and they can in this way be differentiated from one another for eugenic purposes—a most desirable thing.

Again, the study of the supernormal child is incomplete unless we have some means of determining the kinds of mating that produce such progeny. With the accumulation of data incident to the very extensive intelligence testing which is now being carried on, material will be at hand for the formulation of the laws governing the transmission of degrees of general intelligence. Certainly it is significant that of groups of parents and children recently tested by my pupils the combination of parents, both of whom made a record of superior mentality by the Stanford adult scale, gave 80% of children making a superior or very superior record; while when only one parent gave a superior record or both made only an average one, the percentage of superior children was only 33. Our groups were too small to permit our drawing any dogmatic conclusions, but they certainly encourage further investigation.

Another utilization of standardized tests consists in such early determination of special capacity as eliminates the possibility of the gift in question, being the outcome of a peculiarly favorable environment. Every investigator of mental inheritance encounters a difficulty in distinguishing between environmental and congenital factors. The proof that a capacity above the average was manifest at too early an age to permit accounting for it on the ground of training, stamps that capacity as congenital and, probably, as germinal. In spectacular cases of genius, musical and mathematical prodigies, for instance, the general public has not been blind to the bearing of the facts upon the theory of original capacity, but when talent of low degree or specialized ability of any sort is in question the inference of its inheritance has seemed less inevitable. Only the employment of norms, which give us the range of performance for various ages, can enable us to identify with confidence a native capacity at a very early age. My records on children show a number of very interesting instances of the kind in question.

SENSING WEIGHTS

Cases I and II. The children concerned, Bertha C. (age nine years two months), and Clifford C. (age six years



Courtesy of Little, Brown & Company, Publishers

HEALY-FERNALD CONSTRUCTION TEST A FOR INTELLIGENCE

An example of a test which demonstrates planfulness and the powers of learning by experience. The illustration shows the test as presented (upper left), as completed (upper right), and two types of error.—From *Healy's Individual Delinquent.* (Fig. 7.)

five months), are half-brother and sister, and so far as general intelligence is concerned, low average. Their social level would be described as inferior. Both showed, however, when tested by the Standard Revision of the Binet Scale, unusual keenness in discrimination of differences in weight. This was evident not only by their passing of the tests on weight discrimination, but also by their method of procedure. Bertha, for example, retained after her first serial arrangement of five weights such a clear-cut memory of the weight of each block as to be able to place them thereafter in sequence without intercomparison. Her ability to do this, after a preliminary handling, was checked many times. Squares were chalked on a table and she was instructed to place each block in its proper square as soon as she had lifted it. Her threshold for weight discrimination when determined by the standard tests proved to be extremely low for a child of her age. Clifford, her brother, reacted in much the same way when tested with two weights, according to the five-year procedure. Moreover, after a little practice with the blocks, he was able to arrange five in sequence (a nine-year test) by the same method as his sister, namely, an absolute sensing of the weight. It is probable that in other respects also these children possess keen sense discrimination, as when the weight test was tried on a table without our usual velvet cover, Bertha was quick to identify the blocks by their sound in striking the table. Later, on interviewing the mother of these children, we found that their maternal grandfather had, as postmaster, enjoyed a reputation of being able "to tell" the weight of articles without using a scale. The mother reports that she herself does not possess the gift.

Case III.—Virginia F. At the age of two and a half years (1910) Virginia surprised her relatives by a passionate interest in a set of blocks that could be put together to form six different pictures. At that time picture-puzzles had not been exploited as a means of testing a child's development, and careful notes of Virginia's performance were not recorded. Her interest, however, was very evident, and her skill in manipulation seemed extraordinary; she early devised a scheme for rapidly shifting from one picture to another by making such a number of turns per block as was necessary to place it in the new picture.

JUVENILE CAPACITIES

At the age of three years six months, Virginia was put through the 1908 Binet test, making a mental age between four and a half and five years by that scale. My interest was centered largely in the general outcome and I failed to notice significant features of the result. At nine years six months, Virginia was given the Stanford Revision of the Binet Scale and made a mental age of ten years six months. The fact that in spite of her high intelligence quotient she was only "at age" in her school work led to a careful scrutiny of her record. It was evident that her failures to score under the age of eleven were all in verbal tests. She was hesitant in defining words—an actual retardation in readiness of expression and not in comprehension, as she succeeded in the fable test for twelve years and the dissected sentence and similarity test for the same years. Turning back to her record at three and a half years, I find that at that time also, inspite of a very superior performance in other respects, she gave only the infantile form of definition, and that only under pressure. But at that time she knew her right from her left hand, a six-year test, and at nine and a half she manipulates the well-known Healy-Fernald Construction Puzzle A in 20, 18, and 12 seconds for three trials, respectively, although the performance of the average ten-year-old is scheduled at three times in five minutes (Fig. 7). In order to test further her capacity in dealing with form-boards, I put Virginia through the Pintner-Patterson scale of performance tests. Her record on the boards, where ease in spatial orientation is a factor of importance, was extremely

good. By the percentile method of scoring she is found to rank among the best ten or twenty of one hundred children of the same age, for the particular tests under discussion. Such capacity involves nothing spectacular, and is, therefore, of the more value in demonstration of the minuteness with which native traits may be parcelled out. The especial point of interest is the revelation of this capacity in the very early play of the child. It is probable that Virginia inherits her skill in spatial orientation from the paternal side, as her relatives on her mother's side are very deficient in this capacity. At nine years Virginia is absurdly more apt at form-boards than her maternal aunts. She is also much readier than her small brother and sister.

UNIDEXTRALITY

In studying unidextrality and its complications, I have had recourse to comparative measurements of the right and left arms, using Dr. Jones' brachiometer, which has been devised for just this purpose. Virginia shows greater excess of difference in length between the right and left arm than does either of the other children. This I anticipated, since, according to a theory upon which I am at present working, skill in handling spatial relationships is, in part at least, a function of a high degree of unidextrality.

Case IV is that of a very superior child, John H., who, at four years eight months, has a mental age of over six years. But his record in repeating digits after the examiner in both natural and reversed order outstrips his other reactions, since his performance is that of a ten-year-old child. This capacity is shared by a brother, a year older, and is exhibited also by adult members of the family.

Case V.—Paul S., at eight years, possesses a mental age of ten; his vocabulary record, however, is that of the twelve-year-old child. His gift in this direction was evident at two years, at which time a list of the words used within a prescribed time totaled 711, with an estimate of 750 as his actual vocabulary. This is a very remarkable record, as shown by a comparison with other vocabularies reported for children of the same age. Paul's environment is undoubtedly a very favorable one for development of this gift, but only native capacity can explain the fact that his two-year record surpasses that of other children in the same family.

The instances cited above are very simple ones, and no doubt could be easily duplicated. They are, for that very reason, perhaps, more convincing in their bearing upon the all-pervasive quality of mental heredity. Certainly, most psychologists are keenly alive to the big problems involved in mental inheritance and anxious to determine the limits set to training by mental capacity.

"Psychobiology"

A New Publication of Interest to Biologists

Psychobiology will include research on problems which involve mental or conscious factors as details in the total functioning of the organism, as well as biological and physiological researches which contribute to our knowledge of mental function. The topics included will naturally cover a wide range in other respects: problems of psychobiological importance are involved in the study of the sense organs and reactive mechanisms; of inheritance; of pathological and operative conditions of the nervous system; of the thought processes; of emotional experiences; of drug effects and of many other topics. Reports of research on the lower animals will be included in so far as they fall within the field of psychobiology.

The journal is edited by Professor Knight Dunlap of Johns Hopkins University. The subscription price for the United States is $5.00 a volume. Williams and Wilkins Company, 2419-2421 Greenmount Ave., Baltimore, U. S. A.

A FRUITING ORANGE THORN

Thorns Are Modified Leaves or Branches. On Orange Trees They Are Nuisances. Thornless Variety May Be Produced

A. D. Shamel and C. S. Pomeroy

THE Century Dictionary defines a thorn as "a sharp excrescence on a plant: usually a branch or the termination of a stem or branch, indurated, leafless, and attentuated to a point." Botanically speaking, thorns are modified leaves or branches.

A striking illustration of the relationship of some thorns to branches is shown in the accompanying figures. These show the development of abnormally large thorns on rapidly growing branches of the Washington Navel Orange (*Citrus sinensis* (L.) Osbeck). Some of the thorns have developed into branches bearing fruit, leaves and secondary thorns. These varying stages of development illustrate the fact that, in the citrus, thorns are truly modified branches. (Figs. 8 and 9.)

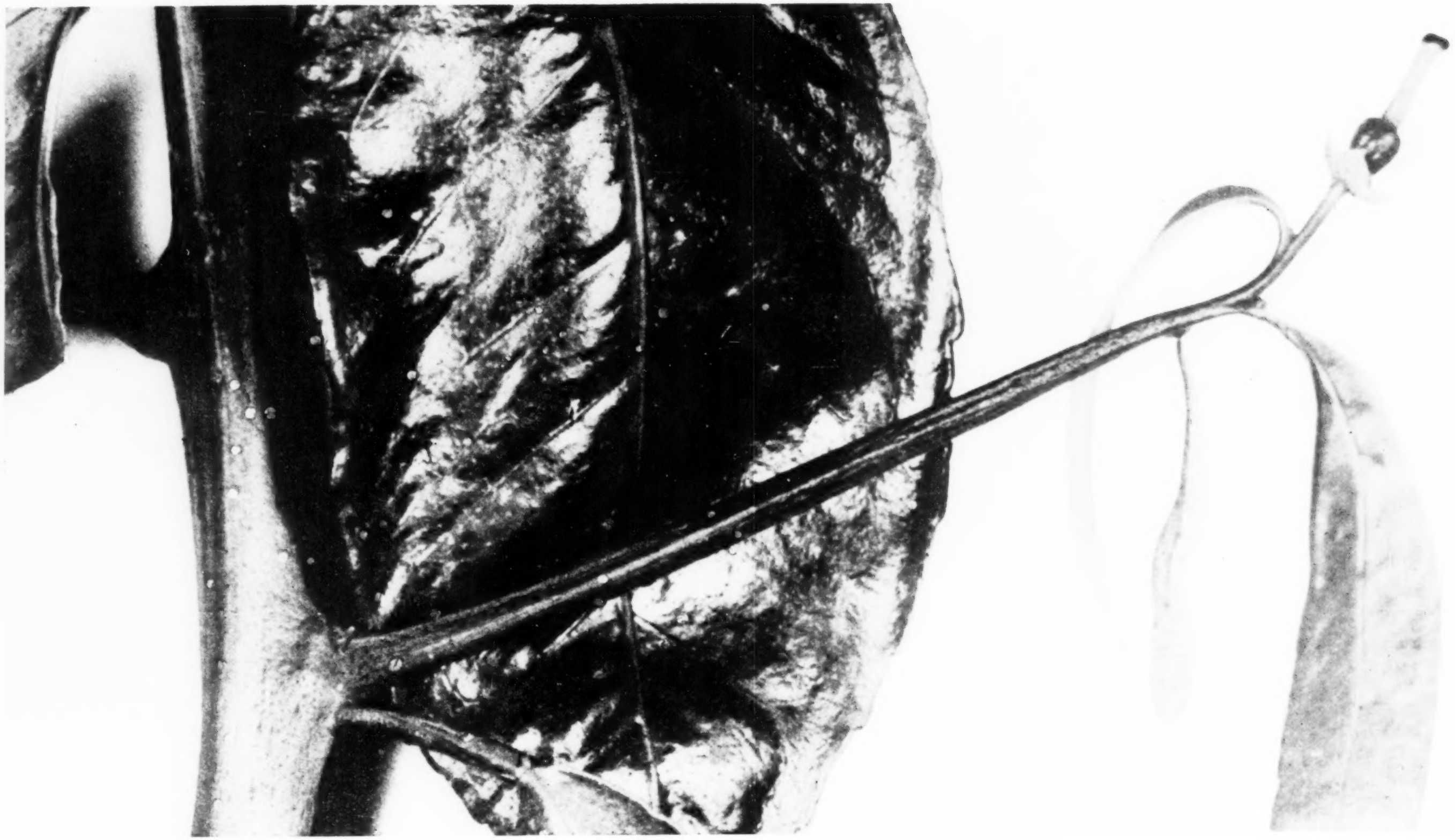
THORN BEARS AN ORANGE

As can be seen in the illustration, one of the thorns bears a small orange. The young navel orange is borne at the tip of the thorn which also bears several small leaves and behaves like a fruiting branch of a navel orange tree.

Thorns in citrus trees, in cultivated orchards, are nuisances. They interfere with the work of picking the fruit, in that they are likely to injure the unprotected hands and arms of the pickers. Instances are known where citrus pickers have suffered serious injuries from thorns, resulting in the loss of fingers, hands and eyes. Furthermore, the thorns are undesirable, as they frequently puncture the nearby fruits. These punctures offer opportunities for the entrance of various fungus diseases which often result in decay and loss of fruit. This decay may take place on the tree, but more frequently occurs after the fruits have been packed for the market. For these and other reasons citrus propagators and breeders have endeavored to propagate thornless strains.

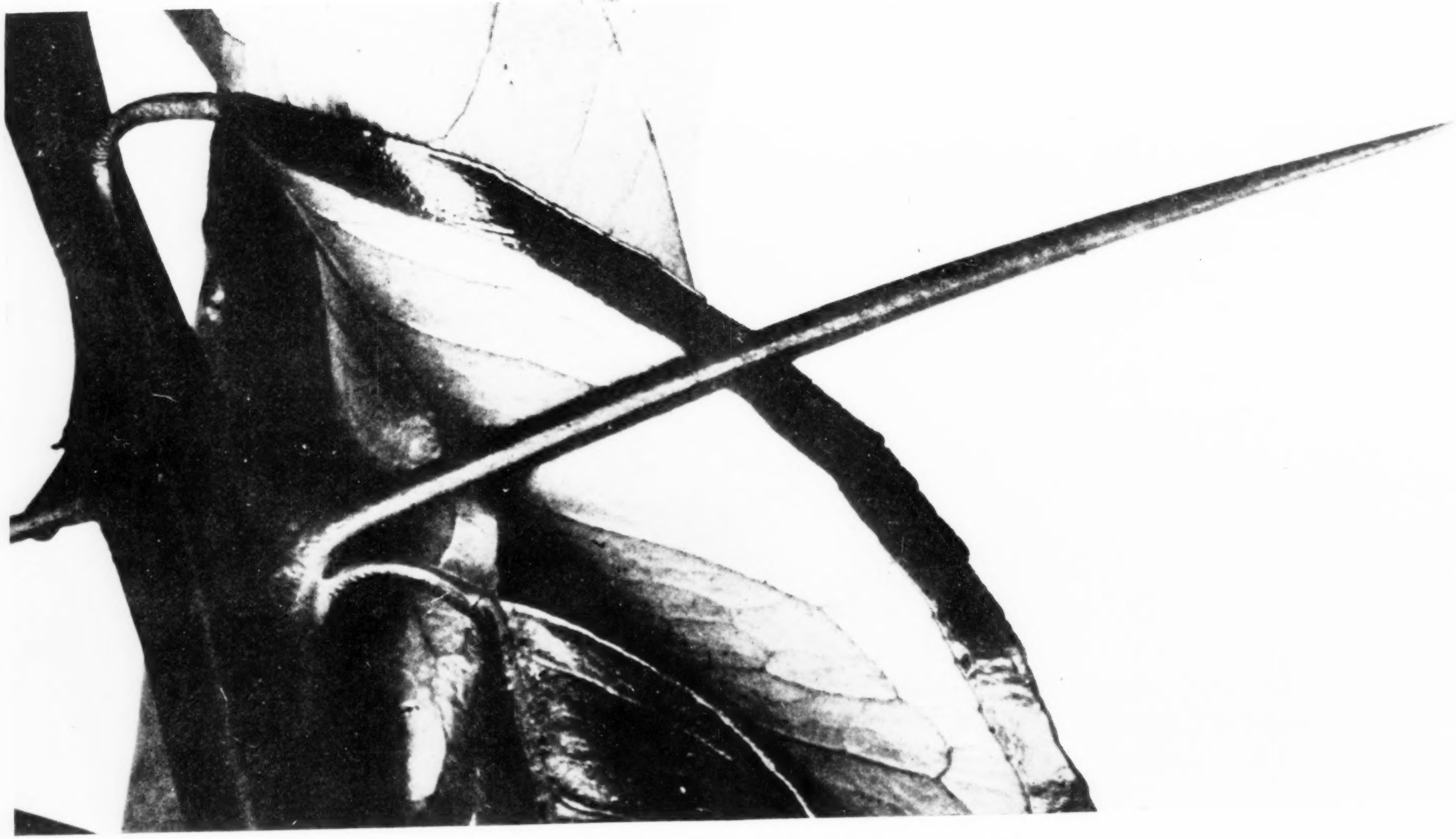
It is a well-known fact that the size and number of thorns vary on the different trees of a variety and often on the different branches of the same tree. Through the selection of buds for propagation from thornless limbs, or those having small thorns, considerable progress has been made in isolating thornless strains, or strains in which the trees produce few and no thorns.

The variation of thorns in the citrus varieties, and in the strains of the same variety, is convincing evidence as to the heredity of this tree characteristic. The variation in thorniness on the trees of the same strain furnishes a basis for the isolation of thornless strains through systematic bud selection.



AN ORANGE THORN THAT BORE AN ORANGE

This orange thorn bears a young navel orange as well as several small leaves. It illustates the fact that thorns may be merely modified branches. (Fig. 8.)



AN ORANGE THORN WHICH IS A NUISANCE

Instances are known where citrus pickers have suffered serious injuries from thorns, resulting in the loss of fingers, hands and eyes. Furthermore, thorns frequently puncture fruits and favor decay. Thornless varieties are desiderata. (Fig. 9.)

TYPICAL LEMON TREE FROM SELECTED BUD

A typical Lisbon lemon tree about 10 years old in the Shippey orchard grown from a bud selected from a productive and desirable parent tree. (Fig. 10.)

LEMON ORCHARD FROM BUDS OF SINGLE SELECTED TREE

Remarkable Uniformity of Fruit Compared with Those from Ordinary Lemon Orchard from Miscellaneous Buds

A. D. SHAMEL, *Riverside, Cal.*

THERE exists in California several citrus orchards in each of which the trees are known to have been propagated from buds selected from a single particularly productive and desirable parent tree.

The trees in the Shippey Lisbon lemon orchard of forty acreas, located four miles north of Porterville, Cal., were all grown from buds secured from a very productive and valuable parent tree. Two thousand trees were planted in this orchard. Owing to a root-rot disease 300 trees have died, so that, at the present time 1,700 trees survive.

The parent tree, located in the Buswell orchard near Porterville, produced, in 1902, 1903, and 1904, yields of 24, 26, and 28 picking boxes of lemons, respectively. Each of the picking boxes contained about 60 pounds of fruit. In 1905 enough buds were cut from this tree to bud 2,000 sweet orange stocks, or, in other words, to propagate enough trees for the forty-acre orchard.

The young trees were grown in the nursery about two years. They were set out in the orchard in 1907. They were arranged in squares 29½ by 29½ feet apart. Fifty trees were planted on each acre.

NO OFF-STRAIN TREES FOUND

A recent study of this orchard by the writer, after the trees had been planted about ten years, revealed a remarkable uniformity in the type of the trees. They all were found to belong to the productive Lisbon strain. Not one off-strain tree was discovered. Some variation in tree characteristics within the strain was found upon close examination. However, to trained observers the uniformity of the trees in all apparent characteristics was truly striking and emphatic. A comparison of the uniformity of the trees in this orchard with the trees of other orchards of the same variety and about the same age, where ordinary methods of securing budwood had been practiced, showed that the trees in this orchard were more uniformly good than those in the other orchards. In Lisbon orcharts where no bud selection, based on performance records and intimate tree knowledge, had been practiced in propagation, it was found that from 10 to 70% of the trees were of variable or off-type strains. In the Shippey orchard not one such tree was found.

The yields shown in this table are much greater than is ordinarily the case. It may also be said that the behavior of these trees is very much like that of others which have been more recently grown from buds secured from parent trees selected on the basis of their performance records and intimate tree knowledge. For this and other reasons, the writer and others believe that the uniformly early and high production of good fruits in the Shippey orchard is largely due to bud selection.

TYPICAL LEMON TREE FROM SELECTED BUD

A typical Lisbon lemon tree about 10 years old in the Shippey orchard grown from a bud selected from a productive and desirable parent tree. (Fig. 10.)

LEMON ORCHARD FROM BUDS OF SINGLE SELECTED TREE

Remarkable Uniformity of Fruit Compared with Those from Ordinary Lemon Orchard from Miscellaneous Buds

A. D. SHAMEL, *Riverside, Cal.*

THERE exists in California several citrus orchards in each of which the trees are known to have been propagated from buds selected from a single particularly productive and desirable parent tree.

The trees in the Shippey Lisbon lemon orchard of forty acreas, located four miles north of Porterville, Cal., were all grown from buds secured from a very productive and valuable parent tree. Two thousand trees were planted in this orchard. Owing to a root-rot disease 300 trees have died, so that, at the present time 1,700 trees survive.

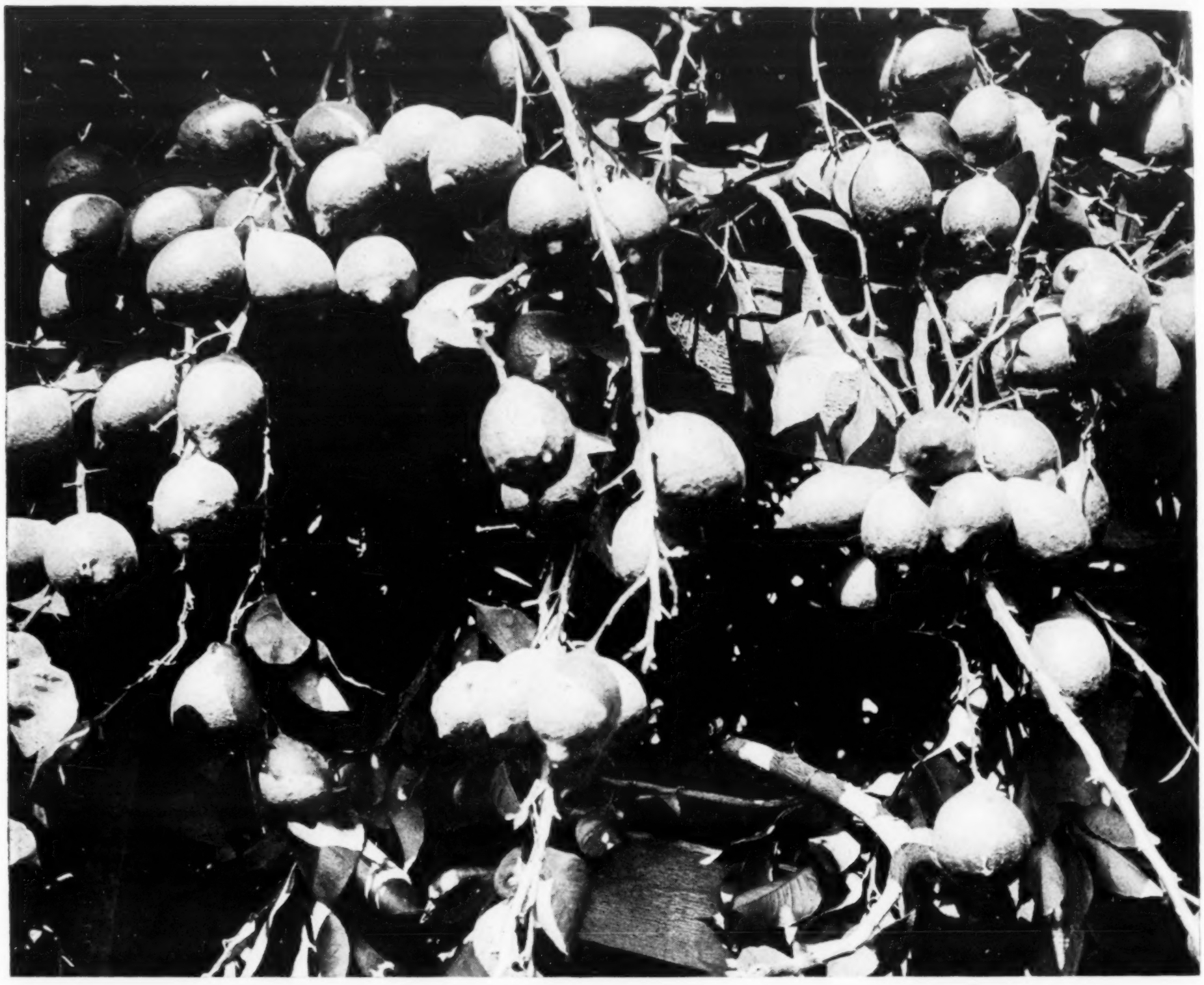
The parent tree, located in the Buswell orchard near Porterville, produced, in 1902, 1903, and 1904, yields of 24, 26, and 28 picking boxes of lemons, respectively. Each of the picking boxes contained about 60 pounds of fruit. In 1905 enough buds were cut from this tree to bud 2,000 sweet orange stocks, or, in other words, to propagate enough trees for the forty-acre orchard.

The young trees were grown in the nursery about two years. They were set out in the orchard in 1907. They were arranged in squares 29½ by 29½ feet apart. Fifty trees were planted on each acre.

NO OFF-STRAIN TREES FOUND

A recent study of this orchard by the writer, after the trees had been planted about ten years, revealed a remarkable uniformity in the type of the trees. They all were found to belong to the productive Lisbon strain. Not one off-strain tree was discovered. Some variation in tree characteristics within the strain was found upon close examination. However, to trained observers the uniformity of the trees in all apparent characteristics was truly striking and emphatic. A comparison of the uniformity of the trees in this orchard with the trees of other orchards of the same variety and about the same age, where ordinary methods of securing budwood had been practiced, showed that the trees in this orchard were more uniformly good than those in the other orchards. In Lisbon orcharts where no bud selection, based on performance records and intimate tree knowledge, had been practiced in propagation, it was found that from 10 to 70% of the trees were of variable or off-type strains. In the Shippey orchard not one such tree was found.

The yields shown in this table are much greater than is ordinarily the case. It may also be said that the behavior of these trees is very much like that of others which have been more recently grown from buds secured from parent trees selected on the basis of their performance records and intimate tree knowledge. For this and other reasons, the writer and others believe that the uniformly early and high production of good fruits in the Shippey orchard is largely due to bud selection.



LEMONS AS THEY ARE PRODUCED IN THE SELECTED SHIPPEY ORCHARD

Lisbon lemons produced by the tree shown in Fig. 11 and showing uniformly good fruit characteristics. (Fig.11.)

PRODUCTION OF THE SHIPPEY LISBON LEMON ORCHARD

Years planted	Total yield in terms of number of packed boxes of about 90 lbs. each	Average yield per tree in terms of number of packed boxes of about 90 lbs. each	Number of trees	Notes
2	16	.....	2,000	
3	1,174	0.58	2,000	
4	2,687	1.49	1,800	Loss of trees due to root-rot, probably due to too much water.
5	5,213	2.89	1,800	The grove paid for itself at the end of the fifth year.
6	Frozen			
7	7,477	4.15	1,800	
8	8,528	4.87	1,750	
9	7,859	4.62	1,700	About 4,000 packed boxes lost by frost. Total average per tree 6.97 packed boxes.

HOW SORGHUM CROSSES ARE MADE

T. E. Nafziger

THE sorghum heads which are not to be used for crossing, should either be bagged, or should be entirely removed from the stalks before their anthers open. This prevents pollen from these heads from falling upon the flowers of the experimental plants before the emasculation [removal of stamens] of their flowers or while the process of emasculation is taking place.

A branch or "ray" is selected from a panicle [flower cluster] of a plant of a pure strain, which has none of the anthers or stigmas exposed. The blossoms must be emasculated before the anthers emerge. Care must be taken however, not to open the blossoms while in their earlly stages of formation, as injury may result to the interior, causing the pistils and the glumes [corresponding to petals in ordinary flowers] to dry up.

A BLUNT NEEDLE MAKES A GOOD TOOL

In emasculating the blossoms, an instrument should be used that is not so sharp as to puncture the anthers, and yet not so blunt as to mutilate the interior of the flower. A steel dissecting needle with the point slightly blunted, can be employed with a fair degree of success in removing the stamens. A common pin could be used, were it not for the slight possible chance of injury to the flower due to the material used in the construction of the pin.

All of the flowers on the branch chosen, except ten or a dozen, are then carefully removed from the branch. These remaining flowers are emasculated by prying the glumes apart very carefully with the dissecting needle. Placing the needle under the three stamens, they are removed one by one from the interior of the flower. If an anther has been punctured during the process of removal, or if the hands have been in contact with punctured anthers, the hands and the needle should be washed in alcohol, and allowed to dry thoroughly before proceeding with the work.

The branch is bagged, after the flowers are emasculated, with a small paraffined paper bag, to prevent pollen from reaching the stigmas of the emasculated flowers. The panicle which has the attached branch, is also bagged (preferably with a waxed bag) to save the pollen for the reciprocal cross. The panicle is then tagged with a label showing the number of the strain, the number of the plant, the number of the reciprocal, and the date when emasculation was done. A representative tag is reproduced in the figure below.

$N+1$ ♀
×
N_1+1 ♂
Date

N = strain number (female).
1 = plant.
N_1 = strain number upon which the cross is made (male).

The same procedure as outlined above, is followed in emasculating the flowers of the strain upon which the reciprocal cross is to be made. The tag on the panicle of the reciprocal would show the following.

N_1+1 ♀
×
N 1 ♂
Date

The first line in the notation on the tag indicates that the tagged plant is the female N_1 and that N is the male plant.

The time elapsing between emasculation and pollination depends upon weather conditions. Ordinarily, the time is about seventy-two hours. The pollen is transferred to the stigmas with a small brush, directly from the bag in which it has collected. The pollinated ray, and the panicle are again properly bagged. In forty-eight hours the bag may be removed from the former.

The milos [a type of sorghum] have proven to be the most difficult to cross, the flowers appearing to dry up, shortly after emasculation takes place. When an anther is punctured during the process of emasculation, the affected flower should be removed from the ray. Too much pollen should not be placed upon the stigmas.

If all the panicles are bagged, thus preventing the pollen from blowing about, the bags may be removed from the rays after each day's work of pollination is completed. The stamens do not emerge during the heat of the day, but emerge freely during the night.

The work herein described was carried on by the writer on the plant breeding plots of the Department of Botany and Plant Breeding, of the Kansas State Agricultural College, during the summer of 1916, under the direction of Professor H. F. Roberts.

Training Little Children for the New Life

Congress has recently recognized the educational needs of little children by making an appropriation to the United States Bureau of Education, to enable it to promote kindergarten education in the several states and territories.

This act is timely, for our people are being rudely awakened to the need of better training for citizenship than our boys and girls are now receiving. They realize the urgent necessity of properly equipping our children for the tremendous tasks they will be called upon to perform after the war is ended.

The Council for National Defense states that there are nearly 4,000,000 children in the United States who can not receive the benefits of kindergarten training either because there are no kindergartens at all or not enough.

Training for citizenship cannot begin too early according to the United States Commissioner of Education, who for months has been issuing, in cooperation with the National Kindergarten Association the series of articles which this paper is printing, to provide better training for little ones in the home.

A drive is now on to have more kindergartens opened throughout the country and parents are circulating petitions to present to their boards of education. The General Federation of Women's Clubs, the National Congress of Mothers and Parent Teacher Associations, Suffrage and labor organizations are all deeply interested in this subject and great hopes are entertained that the drive will receive the hearty cooperation of local school authorities thoroughout the country.

PROLIFICATION IN A DOUBLE-FLOWERED FORM OF CALENDULA OFFICINALIS

Extremely Rare Development of Multiple Buds in Pot Marigold

PETER BISSET

Plant Introducer, U. S. Department of Agriculture.

PROLIFICATION is a word often used by horticulturists to denote a departure from the ordinary method of flowering of cultivated plants. It is used generally where more flower buds are produced than is commonly the rule, and especially so when they appear where ordinarily they would not, as in the present instance, where a number of flower buds were developed from one normal flower head.

Although prolification is not uncommon in some double-flowered plants, the writer has never before seen this occurrence in the Calendula.

These plants were grown in the spring of 1918, at Twin Oaks, Washington, D. C., by Mr. E. G. Anderson, who is superintendent for Mr. Charles J. Bell. My attention was attracted to the strange behavior of several of the flowers; the central flower was apparently normal, but before it was fully developed several buds were produced—some from the center of the flower (see Fig. 12). These developed into flowers and opened fully, although not as large as the first; these later, in several instances again produced buds that developed flowers, they, in turn, not as large as the second tier (Fig. 13).

I left at about this time for the West and therefore did not see the final stages of these flowers, but asked Mr. Anderson to save any seed that might mature so that we could try another experiment to determine if this prolification would become fixed. Unfortunately no seed developed, and the plants, being annuals, were necessarily lost.

This form of prolification often occurs in the double-flowered English daisy, and in England has received the common and expressive name of the Hen-and-Chicken Daisy. Prolification also frequently occurs among our common roses. In the rose, however, it often takes the form of the prolonged flower stalk coming up from the center of the parent flower, often producing leaves and then a bud which develops later into a flower.

The Calendula plants, here shown, were grown in a greenhouse bench in rather rich soil and where they were given the best of care as regards watering, temperature, fertilization, etc.—in fact, ideal conditions for the best development of normal flowers. It might be asked, were the conditions conducive to the production of such prolified flowers as were borne by several of the plants. I am inclined to think that this was the case, and that they were over-stimulated.

POT MARIGOLD PROLIFICATION

Pot marigold (*Calendula officinalis*), showing the flower head, with buds and flowers. Many flower buds are in the course of development in the central or main flower, and can be seen in the illustration. (Fig. 12.)

POT MARIGOLD PROLIFICATION

Pot marigold (*Calendula officinalis*) showing the flower prolification further developed. The outer or secondary flowers shown here produced later other tiers of flowers not shown in the illustration. (Fig. 13.)

NATURAL CROSSING IN WHEAT[1]

A Cause of Impurities in Breeding Plots—Belief of Some Agronomists that Hybrids Frequently Revert to the Parental Type

H. K. HAYES

Minnesota Agricultural Experiment Station

SOME difference of opinion exists among plant breeders as to the frequency of natural crossing in wheat, some contending that such crosses rarely, if ever, occur, while others believe that natural crosses are comparatively frequent. Botanists do not all agree regarding this question; for Robbins[2] states that durum wheats have the habit of cross pollination, and also states that cross pollination appears to be the rule in hot, dry countries, as in certain parts of India, while in the northern, wet climates close pollination is the rule. On the other hand, Früwirth cites Körnicke as an authority for the statement that self-fertilization is by far more prevalent, but cross pollination is possible in *T. vulgare, T. durum, T. dicoccum,* and *T. spelta.*[3]

As this subject is of much importance to wheat breeders, and also of interest to crop experts and farmers who are desirous of producing pure seed, a note as to the frequency of natural crossing at University Farm may be of some general interest. For a fairly complete summary of literature on this subject the reader is referred to a literature review by Pope (previous citation).

FREQUENCY OF NATURAL CROSSES AT UNIVERSITY FARM

The evidence here given is believed to be about as complete as circumstantial evidence can be. In order to appreciate it, a knowledge is necessary of the behavior in crosses of a few simple differential wheat characters. These facts are well known by wheat breeders who have made artificial crosses.

Varieties commonly grown in the Northwest may be placed in two groups:

Group 1.—The so-called awnless wheats, as Marquis and the Bluestem varieties. These have very short awns on the upper spikelets.

Group 2.—Bearded sorts, such as Preston, Arnautka, Kubanka, and Turkey (winter).

Crosses between such bearded and awnless varieties give heads with intermediate awns on the tip of the head, and shorter awns on some spikelets from the middle to upper part of the head. In F_2 a ratio of 1 awnless, 2 F_1 types to 1 bearded is generally obtained. There is some difficulty in separating a homozygous awnless from an F_1 between awnless and bearded, but the separation is very easy between an F_1 and the bearded sort.

A cross between a hairy chaffed variety, as Bluestem, and a smooth chaff, as Marquis, has hairy chaff in F_1 and in F_2, 3 hairy to 1 smooth is the expected result. A hairy chaffed plant in a row of Marquis or other smooth chaffed variety is therefore easily determined.

Indications of natural crossing were observed in 1916 and 1917 in the nursery wheat plots at University Farm, and the conclusion was drawn that nat-

---

[1] Published with the approval of the Director as Paper No. 137 of the Journal Series of the Minnesota Agricultural Experiment Station.

[2] Robbins, W. W. The Botany of Crop Plants. Philadelphia, 1917.

[3] Pope, M. N. The Mode of Pollination in Some Farm Crops. *Jour. Amer. Soc. Agron.,* Vol. 8, 1916, pp. 209-227.

NATURAL CROSSES AND PURE TYPES OF WHEAT

1. At right, head of a pure variety segregated from a cross between Turkey (winter) and a Fife. At left, a natural hybrid between this variety and Bluestem which was found in a row grown from an individual plant.
2. Pure type of Preston at right and natural hybrid at left. One such cross was found in a row of forty plants all of which were the progeny of a single plant selected the previous year. (Fig. 14.)

ural crossing in wheat was more common in the Northwest than had formerly been supposed to be the case, or that the seasons of 1915 and 1916 were very favorable for cross pollination.[4] The results here reported show that in 1917 there was also considerable natural crossing.

The plan has been followed of growing a purity plot of 50 to 100 plants each year of those selections and crosses which are being tested for yield in the rod rows. In these purity plots each plant is individually spaced and each plot is grown from a single plant selected at random from the previous year's purity plot.

In 1917 rows of Haynes Bluestem, an awnless, hairy chaffed wheat, were grown alternately with the purity plots. Individual plants for 1918 planting were selected in each purity row as usual. In 1918 these purity rows were carefully examined, and those crosses which could be determined were noted. The number of such crosses is given in the table in the appendix (page 334).

Aside from these, which were grown near Bluestem the preceding year, there were 49 other spring wheat plots grown from individual plants. Four thousand was the approximate number of plants examined in these 49 plots. Nineteen plants, which were F_1 crosses were observed. The rod row plots were also examined in both the spring and winter wheat nurseries. No crosses were noted in the durum rows, of which 24 were grown. Approximately 400 rod rows of spring wheat (*T. vulgare*) were examined, and 52 plants were found which were believed to be the result of natural crosses. Only such crosses as could be accurately determined were counted.

In the winter wheat nursery the purity rows were almost entirely winter killed. Between 600 and 800 rod rows were examined, and over 100 plants were observed which were believed to be F_1 crosses. Many absolutely clear cases were found; for example, plants with intermediate awns in bearded varieties belonging to the Crimean group. A number of such plants were found in rows of Turkey pure-line varieties obtained from Mr. Burnett, of the Ames Experiment Station. The crosses were noted the second season that they were grown at University Farm.

Observed crosses in Triticum vulgare lines average 1.3%, and the conclusion is certainly reasonable that cross pollination occurred as often between plants of the same variety as between different sorts. This would mean that natural crossing in 1917 was at least 2% to 3%.

NATURAL CROSSES AS A DIFFICULTY IN PURIFYING HYBRIDS

Among the sorts which have been tested for yield in the spring-wheat nursery are several crosses between Turkey (winter) and a Fife variety. These crosses were made many years ago, and are now comparatively pure. In 1915 some hairy chaffed intermediate awned wheats were noted in the rod rows of these crosses. An attempt was made to rogue these out, and in 1916 several plots of each of these sorts were grown from individual plants. These all apparently bred true, but when they were again placed in rod rows in 1917 there were again a few off-type plants, and many of these were clearly F_1 crosses. Unless these had been carefully studied, the natural conclusion would have been that this wheat could not be bred true. A few such F_1 plants overlooked may be a cause of much greater mixture the following year. Results of this nature are believed to be a logical explanation of the cause for the belief of some agronomists that hybrids frequently revert to type.

During the last few years a considerable number of commercial samples of Preston, Haynes Bluestem, Minnesota 169, and Marquis have been examined. The Bluestem and Preston samples were

[4] Hayes, H. K., Natural Cross Pollination in Wheat. *Jour. Amer. Soc. Agron.*, Vol. 8, 1916, pp. 209-227.

PARENTS AND F_1 CROSS BETWEEN THEM

At left (1) a Minnesota pure line selection of Durum, named Mindum. At right (3) Marquis. The F_1 cross is shown in the center (2). Note that the F_1 has longer tip awns than the Marquis parent. (Fig. 15.)

On the level plain of routine, where most of us pass our lives, intelligent men are agreed that in material affairs human progress is best served by expert knowledge and firm leadership, held by the few and by them employed to direct the energy of the mass. The recognition of this fact is, indeed, the regulating principle of commerce, of industry, and of agriculture. In the field of conduct the same principle is accepted—the rare man of high morality as the guide and inspiration for the common run of men. The priest does not poll his flock as to the sinfulness of murder, nor the captain his crew as to the vessel's course, nor the architect his workmen as to the span of the arch, nor the farmer his hands as to the rotation of the crops.

Yet the moment we enter the field of politics we are asked to reverse the whole process of reasoning which has been our guide in the familiar round of duty, and to apply to the most complicated, the most technical, the most pressing problem ever presented to man's genius—the problem of modern government—a method no one has ever applied to his simple, personal affairs; the control of the expert by the inexpert.

Take a simple case. If I, a student of government, attempt to advise two axmen as to the felling of a tree, the humor of the situation strikes them at once. But if they, the axmen, differ with me as to the comparative merits of a tax levy and a bond issue, of an appointive and an elective judiciary, of specific and ad valorem customs duties, no one's sense of humor intervenes to prevent the axmen making their view prevail at the next election.

The assumption in the former case is that their judgment is better than mine, in the latter that mine is better than theirs. But, whereas, in the former case their rightness and not their number is properly accepted as the determining cause of action, in the latter the issue is held to be properly decided by *their* number and not by *my* rightness.

The explanation of this phenomenon is, in fact, simple. The principles upon which we act in our non-political capacities have been gradually evolved through a process of trial and error, and they represent a qualitative foundation for authority. The determining principles of modern political action were on the contrary, evolved in the heat of revolutions, and represent a quantitative foundation for authority. They were given their currency by rhetoric and not by reason; and they were surrounded, through the violence attending their birth, with a sanctity which has imparted to all criticism of their eternal truth the odium of sacrilege.

From these causes, and from our blind acceptance of a religious doctrine —the natural rights of man—as a practical political principle, we have fallen into a rhapsodical posture toward the democratic form of government. That this posture reflects the influence of an ultra-rational sanction is suggested by the circumstance that when, after a century or two of democratic control, democracy finds its public affairs besmirched by corruption and bedevilled by incompetence, the cry ascends to heaven "Give us *more* democracy, and all will be well!"

This is precisely the reaction of the drug-fiend. The worse his symptoms become, the louder does he call for a larger allowance of his drug. We have, in a word, brought ourselves to regard democracy as a magic elixir which, if we take enough of it, will transmute the base metal of human frailty into a glittering amalgam of virtue, wisdom, and gentleness.

So general opinion has taken up a position behind two points of defense, one that mental and moral habits acquired during the lifetime of the parents can be transmitted to offspring, the other that the law of heredity applies only to physical traits. That these theories are mutually destructive has not in any way affected their popularity amongst those who do not know that each of them is false.

Those who assume the task of reconciling the facts of democratic control with its theory adopt an expedient which places the whole issue beyond the reach of reason. They lay down the rule that democracy must not be judged by its yesterday or by its today, but by its tomorrow; and that so fast as tomorrows become yesterdays even so fast must all adverse evidence be discarded as worthless. Just below the ever-receding horizon of time there lies, almost in sight of those who accept this rule, the pleasant land where education and dietetics shall have made the majority of mankind into political units from which there can be built up a government of benevolence, righteousness, and efficiency.

THE BIOLOGICAL FACTOR IN POLITICS

My strong dissent from this view of politics rests mainly upon four broad grounds:

1. That acquired characteristics are not inheritable.
2. That within the field of man's mental and moral traits there operate immutable laws analogous to those, which are almost universally accepted by biologists, for physical inheritance.
3. That assortative mating operates unremittingly to depress one end of the moral and intellectual scale and to elevate the other.
4. That the individual and not the mass is the main source of human advancement.

Now these statements are either true or false. Of the first three biologists alone are competent to express an authoritative judgment. In my mouth they are no more than opinions. Subject, however, to what biologists may determine to be their value, it is clear that, if they are true, the whole argument for democratic government falls to the ground, or, more precisely, the argument that efficiency in government arises from, or can be made to depend upon its democratic quality.

The non-inheritance of acquired traits deals a fatal blow to the common belief that education can give the offspring of educated parents a better natural endowment than the offspring of uneducated parents. Our misconception of the function which education performs has, indeed, become embedded in the English language, for we employ the word "education" in the sense of training or instruction, whereas its fundamental meaning is "bringing out." This distinction goes to the very root of the matter. Education *can* bring out that which is in a man; it *cannot* put into a man that which is not there. It can impart facts to ignorance (ad-ducate, if there were such a word); but it cannot make a dullard bright or a fool sagacious. It is, of course, highly desirable that each generation should be, as it were, dipped by the schools into the ocean of fact, even though, for most of us, the point of saturation is very quickly reached.

Government, however, does not derive its efficiency from a mere knowledge of facts, but from their intelligent interpretation; and the reason why education cannot have a cumulative effect upon government is that intelligence cannot be taught and that knowledge cannot be inherited.

Few persons, I imagine, will refuse their assent to the statement that any political system, however perfect its mechanism, must be rendered wholly ineffective if its administration is entrusted to men of low intelligence. But it is a matter of common observation that intelligence is a quality native to some minds and foreign to others; that is to say, it is born in the brain and cannot be imparted to it from without. Those who have it possess something which cannot be bestowed or withheld by the authority of a monarch or by the vote of an assembly. Perhaps the most acute observation which has been made about the Germans is that they know everything and understand nothing.

What is true of intelligence is true also of the other mental qualities; and it is of the utmost importance to the

present enquiry that we should know whether these qualities, which cannot be produced by education, are transmitted by inheritance. So far as this question relates to genius it has been the subject of a number of researches, of which Francis Galton's "Hereditary Genius" is a familiar example. But so far as it relates to all the mental qualities—good and bad, strong and weak—I know of but one careful and extensive investigation, that contained in Dr. Frederick Adams Woods's "Mental and Moral Heredity in Royalty."

From an elaborate study of the royal families of Europe during four centuries, Dr. Woods reaches the conclusion that mental and moral differences are almost entirely due to the influence of heredity, and that they are but slightly affected by environment. Dr. Woods's investigation is, so far as I am aware, the first in which the influences of heredity and of environment in man have been separated and measured. Of great interest from the political and social standpoint is the correlation between mental and moral qualities, which Dr. Woods's figures revealed. Averages show that persons strong in mental qualities are usually strong in moral qualities as well.

IMPORTANCE OF LEADERSHIP

To these facts about the hereditary quality of mental and moral traits another must be added if a full appreciation of their force is to be reached. Throughout all human society there is a strong tendency for like to mate with like—the rich with the rich, the successful with the successful, the poor with the poor, the intelligent with the intelligent. This tendency exerts a powerful cumulative influence, which is constantly widening the gulf which separates mediocrity from talent; and the lapse of time is, therefore, making, talented families more talented, and forcing others further and further below the line of mediocrity. It appears, then, that mankind is not breeding towards an average, but towards two extremes.

I pass finally to what history teaches us of the importance of greatness in the individual. The question resolves itself actually into a choice between a qualitative and a quantitative theory of causation in human achievement.

To whatever phase of human development we turn, history fails to furnish a single instance in which an accomplished step in human progress can be referred, ultimately, to any cause other than the quality of greatness in the individual. It is this quality which has given the world all that has ennobled man's character, elevated his culture, and extended his mastery over the material elements of life. It is to the genius of a few hundred individuals among the thousands of millions who have lived, that we owe all the inspiration of religion, philosophy, music, art, and literature; all the benefactions of science, discovery, and invention.

We appear to be at the threshold of an era in which the last shred of authority is to be stripped from wisdom and talent, in which the destiny of the world is finally to be committed to the blind God of Numbers. If biology can enforce a teaching by which this catastrophy may be averted, the interest of humanity demands that the effort should be made before the hour of its possibilities has vanished.

Assistant Secretary Ousley Tells Need For Still More Food Production

Declaring that "this situation and the fact that 2,000,000 men in France hardly could be demobilized in time to restore normal farm labor conditions for the next year's planting and cultivation," Clarence Ousley, Assistant Secretary of Agriculture, in an address before the New York Humanitarian Society, said that city people must help the farmers in even larger numbers in 1919 to insure adequate harvests of food crops.

ANOTHER HEN THAT CROWED

WILLIAM H. GATES
Professor of Zoology, Louisiana State University, Baton Rouge, La.

THE assumption of the secondary sexual character of the opposite sex by an animal has been noted and mentioned in a number of papers. THE JOURNAL OF HEREDITY illustrates the case of a Buff Orpington hen which acquired the characters of the male in the matter of the comb. A somewhat similar case occurred in our own flock of White Wyandottes and a more or less complete examination of the individual was made.

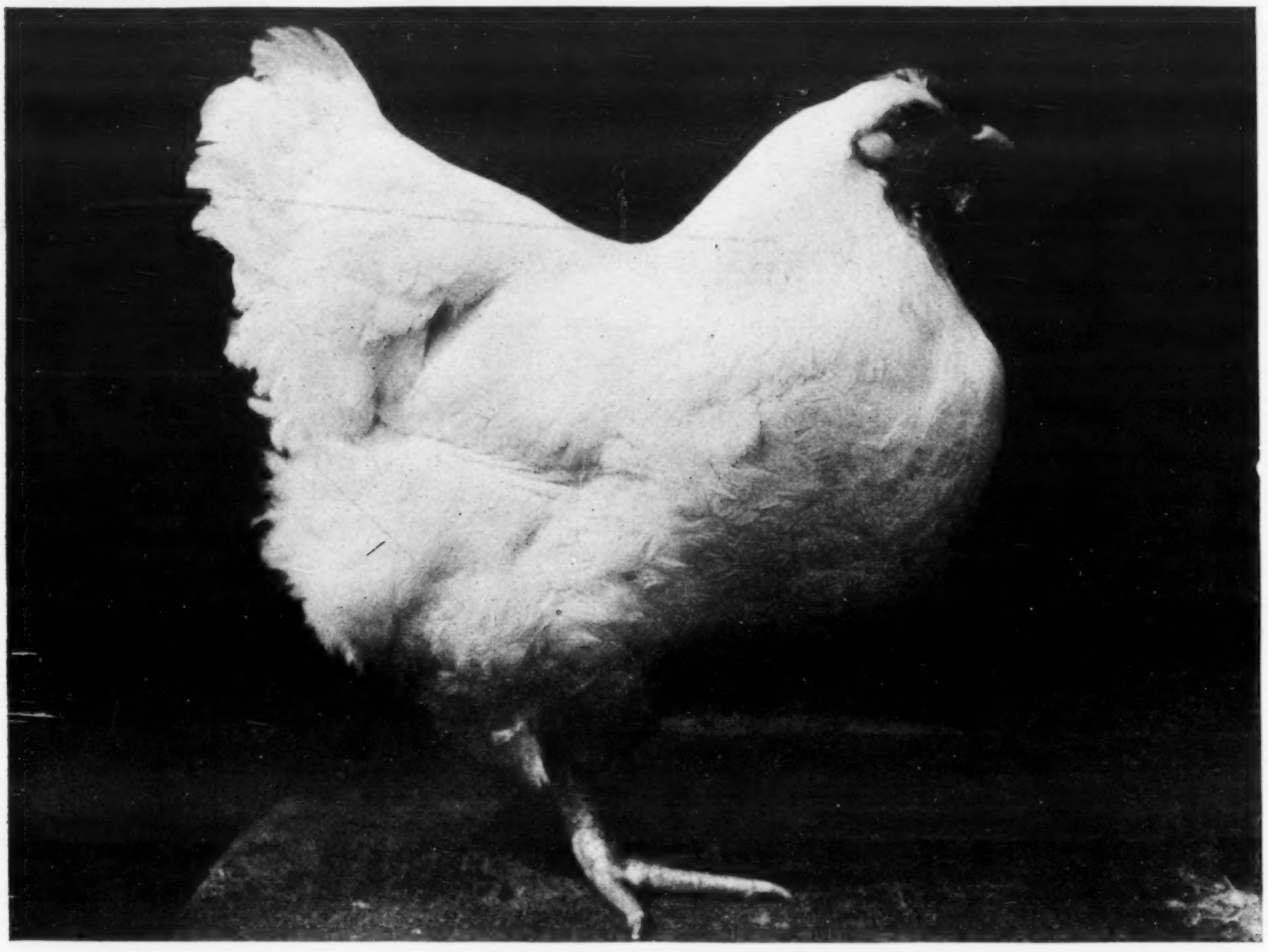
The hen was hatched on March 24, 1913. Both her sire and dam were of good "show stock" and were exhibited a number of times and won several first prizes. She herself, however, was not a show specimen, but during her pullet year turned out to be an extra good layer. She was not trap nested, but was in a pen of but five birds and could therefore be easily watched and her performances noted. It is not a difficult matter in a small pen of this size to learn to know the egg of each individual, and while one is apt to slip up at times and make a wrong guess, on the whole the records are fairly accurate. The laying record of this hen, made in this way, shows her to have laid 196 eggs during her pullet year. It was on the basis of this record that she was kept in the flock and was mated for breeding purposes in both 1914 and 1915. It was also on this record that she was kept over the molt in 1915 with the intention of using her again in 1916 breeding pens.

While there are no absolute records of the number of eggs laid by this hen in the breeding pens, there is satisfactory evidence that she did her share of the laying, for at the end of the season she showed every sign of having been a consistent layer. Such characteristics as pale shanks and beaks, late molt, etc., which, as every poultryman knows, indicate that a bird has not been idle.

There is no record of the number of times this hen went to setting during her pullet year, but in the breeding pens she went to setting twice in the season of 1914 and three times in 1915, showing again that she had probably laid the normal number of clutches of eggs.

Up to the fall of 1915 she showed no sign of being anything but a perfectly normal hen. Her comb, if anything, was smaller than the average Wyandotte, probably an inherited quality of the shown characteristics of her parents. Her shanks were clean and free from stubs and feathers, and the spur head, as in other hens of this variety, was hardly noticeable. During the molt of 1915 this hen lost all of her feminine characteristics and assumed decidedly those of the opposite sex. The comb increased to that of the average male of fancy stock; the spurs, which up to this time had been entirely dormant, grew very rapidly, reaching the size shown in the photograph in about three months; both the hackle and saddle feathers, while not as fully characteristic as in the male, showed the distinctive narrow feathering.

In her actions she changed completely; she started crowing, and in a short time developed a full, prolonged crow. She, however, crowed only early in the morning, never, so far as known, after she left the roost, but regularly every morning she would crow for an hour or so before daybreak. When given grain she would call the other hens with the characteristic clatter. When entirely separated from males she was occasionally known to tread other hens. In fact, in every particular she seemed to have acquired the male characteris-



HEN WITH MALE CHARACTERISTICS

Photograph of the hen that crowed, just before being killed. Notice the partial development of the narrow hackle and saddle feathers. (Fig. 1.)

tics both in her appearance and actions. The growth of feather stubs between the toes during this last molt, while not characteristic of male, evidently indicated a change in her constitution for there had been no indication of anything like this at any time previous.

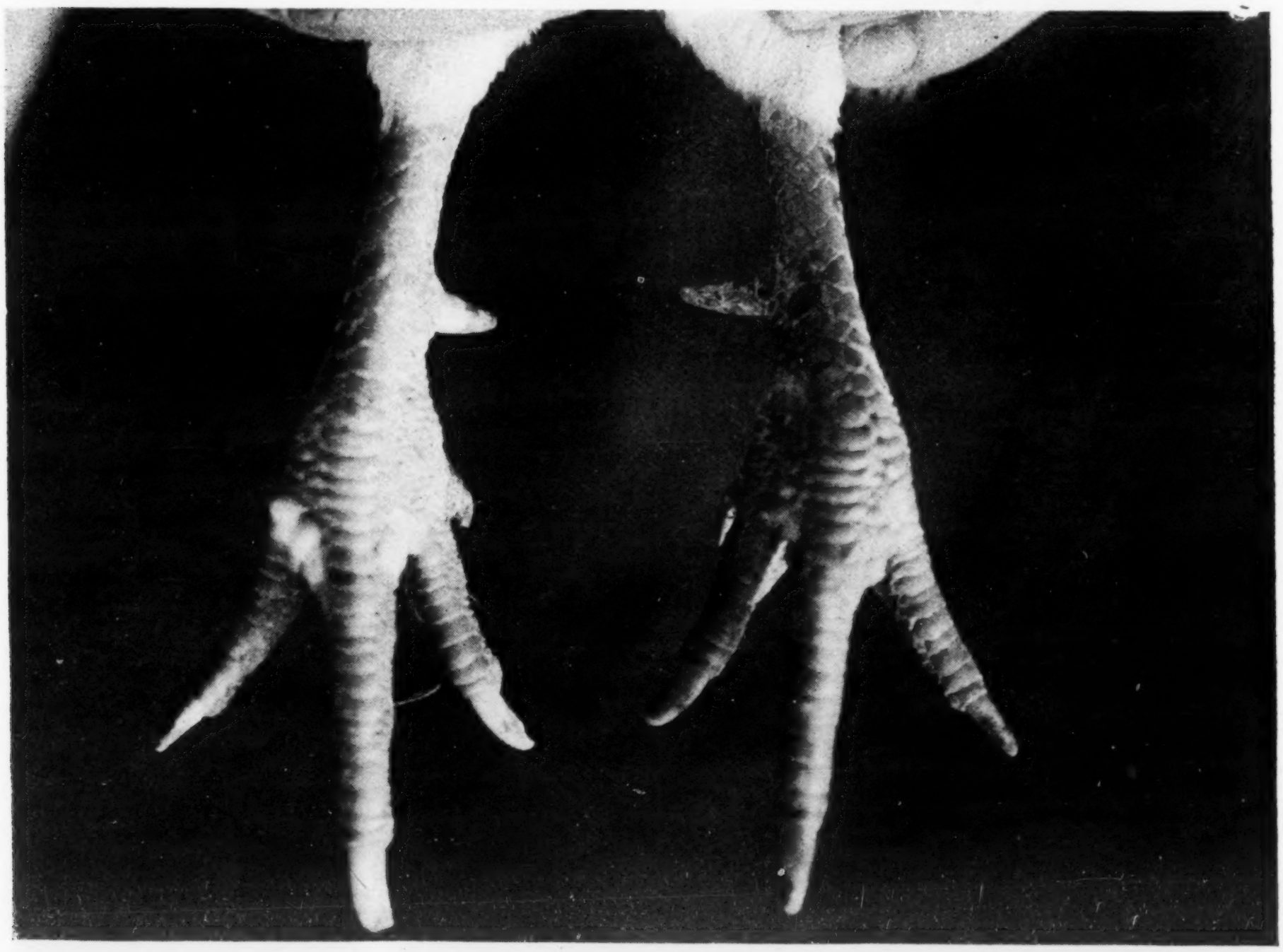
She was killed in the laboratory during November, 1915, and a careful examination of the reproductive system made. The oviduct throughout its entire length, including Fallopian tubes and uterus, had atrophied, consisting of a wrinkled mass of fibrous connective tissue. The lower glandular portion of the oviduct had shrunk to the size of an ordinary match and was tough and hard.

Fig. 4 is that of a normal ovary in a completely dormant state, that is after the hen had been setting on eggs for three weeks. This same ovary in cross section showed the follicles and the ova in all stages of development, normal connective tissue being present in the spaces between the follicles. Externally there are no indications of any follicles, but there were scars of ruptured Graafian follicles. In the ovary of the hen that crowed there were no follicles; the entire ovary showed complete cystic degeneration. It was a mass of connective tissue cells surrounding the large cystic cells. Scars of apparently normal Graafian follicles were present. The large cystic cells were all more or less filled with secretion granules.

Summary. — A perfectly normal White Wyandotte hen, after having two years of normal life in which her reproductive functions showed above the average, lost this capacity and in a short time acquired all of the characteristics of the male both in appearance and actions. Upon dissection the cause of these changes was found to be the cystic degeneration of the ovary, the entire organ having lost its normal structure and instead filled with a mass of connective tissue and cystic cells.

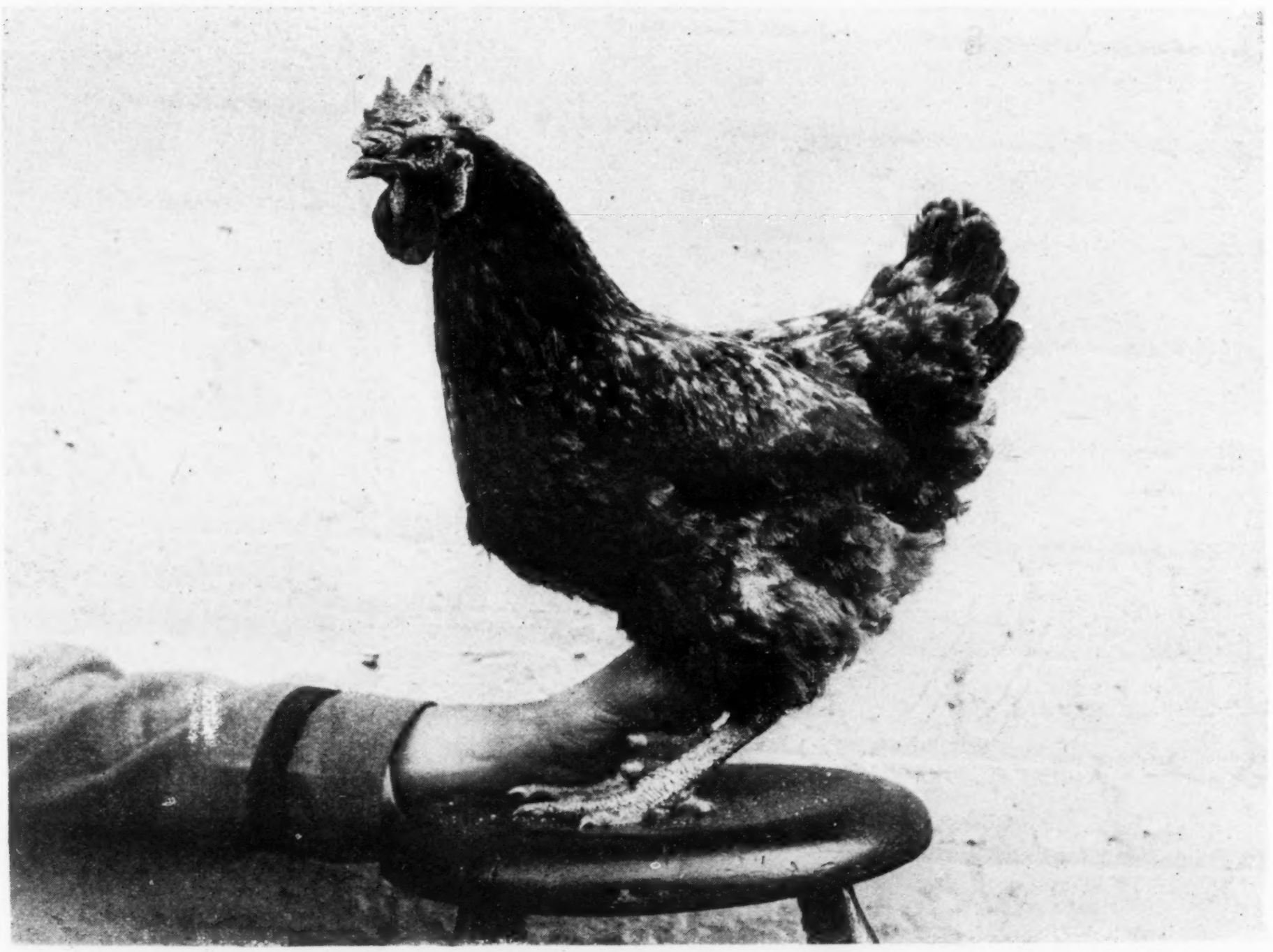
HEAD OF A HEN THAT CROWED

A view of the head, a little smaller than natural size. Note the enlarged comb and wattles and particularly the development of the feathers of the neck, giving that full, arched neck, characteristic of the male. (Fig. 2.)



A view of the feet, smaller than natural size, showing the development of the spurs, which are slightly more slender than the average male. (Fig. 3.)

A normal hen ovary in a dormant state. Photograph taken after hen had set on eggs for three weeks. Eggs in various stages of development are shown. (Fig. 4.)



Still another hen that crowed. A Rhode Island Red that acquired the male characteristics in the comb, and in crowing. The comb in this case was enormously developed, considerably above that of the average of this variety. This hen crowed almost constantly. She was said to be normal in her younger days, and assumed the male characters during her fourth year. (Fig. 5.)

The head of the hen in Fig. 5. Note the size and coarseness of the comb, which is unlike the males of this variety. The complete history of this hen could not be obtained. (Fig. 6.)

Inheritance of Absence of the Sense of Smell

Some time ago one of our correspondents inquired whether the absence of a sense of smell was hereditary. At that time we had never heard of an instance and the literature, so far as known to us, made mention of no cases whatever. Quite recently, and entirely by chance, an example of this rare defect has come to our notice.

The person in question is quite devoid of the sense of smell. Odors, perceived by ordinary persons in the ordinary way, if sufficiently strong, are simply "felt." The person in question, a man, has a brother affected in the same way. Their mother likewise had the same curious defect. In the same family there is a first cousin also without the sense of smell, but this case is really an independent heritage brought in from another family. Apparently the locus of origin, in Russia, is a locality in which this defect is being inbred.

So far the number of instances and certain other details are too meager to allow us to say anything very specific about the manner of inheritance, whether, for example, the trait is sex-linked or not. Still it does seem safe to classify it among traits that reappear in succeeding generations and therefore is hereditary. — O. C. GLASER, *Good Health*, December, 1918.[1]

---

[1] Professor Glaser has also discussed this case in *Science*, December 27, 1918.

KAISERISM AND HEREDITY

Despots Are Largely the Product of the Breeds of Kings—Ancestry and Relationship of Caligula, the Roman Emperor—Comparison with the Kaiser

FREDERICK ADAMS WOODS

Lecturer on Biology, Massachusetts Institute of Theology

A GREAT sensation swept over the German Empire in 1894. The young Kaiser, fresh in his untried power, had been, in a thinly veiled innuendo, compared to that horrible tyrant of the Roman Empire, Caligula Caius Caesar. It was all the result of a small *brochure* written by a quiet scholarly professor, of socialistic proclivities, one Quidde by name. The sensation lasted for some time, and was intensified by the appearance during the same year of a second publication, an anonymous supplement by the same author, *"Ist Caligula mit unserer Zeit vergleichbar?"*

The first pamphlet passed through twenty-nine editions before September, 1894, at which time, it is now amusing to see, the British *Saturday Review* referred to it as "a scandalous and outrageous production." Professor Quidde was a mild and well-meaning idealist whose vision anticipated the coming Caesarism in Germany, with all the evils attendant upon irresponsible control in the hands of one man. Of course there was much that was unjust in a complete comparison of the Kaiser with Caligula, especially in carnal characteristics—dissipation, gluttony and indolence. But there were many points of similarity—enough in fact to bring Quidde unpleasantly near a prison sentence. The German government had a delicate problem to handle. They did not care to fan the flames; yet how could they pass unnoticed such an outrageous example of *lèse-majesté?* It is said that at the trial the government prosecuter asked Quidde whom he had in mind when he wrote that article about Caligula. Quidde very cleverly replied, "I had in mind Caligula, but whom did *you* have in mind when you asked me the question?" The whole affair was too intangible. The matter was dropped and passed out of men's minds.

Now that subsequent events and the great war have brought out the truth of much of Quidde's grim foreboding, it is interesting to reconsider the life and characteristics of this arch tyrant of Rome, particularly in relation to the inheritance of mental and moral qualities as revealed by a study of the house of Caesar, that extraordinary family to which Caligula belonged. Caius Caesar, to give Caligula his true name, making all allowances, was undoubtedly one of the worst examples of royal tyranny, unchecked brutality, and egotistical madness that the world has ever seen. It is true that a large portion of Tacitus dealing with this period is lost, that Suetonius was a gossiper, and that aside from the dry narrative of Dio, we have comparatively little in the way of contemporary sources; but enough remains to make it fairly certain that the accounts about Caligula are substantially correct.

Baring-Gould has written a painstaing and apparently impartial work dealing with all the members of the family of the Caesars, from Julius Caesar to Nero. He does not in the least show a disposition to belie his characters, nor does he fail to bestow praise where praise is due. He discusses the sources of our knowledge of these persons in the light of modern criticism, yet his conviction is very certain that as far as Nero and Caligula are concerned, there is every reason to

believe the worst that has been said about them. The same idea is gained from reading H. F. Pelham's "Early Roman Empire" in the *Quarterly Review* for April, 1905.[1]

Caligula, who, on his accession, was but twenty-five years old, began his reign very promisingly and ruled in a sensible manner for about eight months, when a sudden sickness overcame him, and ever afterwards his nature was changed. It is highly probable that this disease was a severe form of epilepsy, a malady from which the great Julius Caesar is know to have suffered. Such is the opinion of Baring-Gould, whose characterization of Caligula is presented in the following excerpts, taken from that writer's comprehensive work, "The Tragedy of the Caesars." It may be said in passing that the picture drawn by Professor Quidde was no more sensational than the one contained in this seemingly impartial work by Baring-Gould.

"Now, Caius Caligula we know suffered from both the worst form of this disorder [epilepsy] as well as from the less serious; and there can be little question that the sickness mentioned by the historions, but unfortunately not described by them, was a violent attack of epileptic fits, which when they passed left Caius in a measure deranged. Surely this table speaks for itself." [Baring-Gould has here inserted a small chart showing insanity in six members of the family. The relationships of these six and others of the family are shown on the chart, page 350, of this journal.]

"Whatever his malady was, the prince rose from it very much changed, if not in disposition at all events in conduct. If hitherto he had worn a mask, with convalescence he cast it aside; if for a period of a few months he had rejoiced in the favor of the people, and had striven to retain it, he now found a pleasure in striking awe into their hearts, and in dissipating every particle of the affection he had inspired.

"He began to suffer from want of sleep; he seldom obtained more than three or four hours rest in the night and then could not sleep soundly, as he was disturbed with frightful dreams, fancying that old Ocean conversed with him in roaring tones. Unable to be quiet when sleep forsook him, he would sit up in bed the prey to wild fancies, schemes and terrors, or ramble about the porticos of the palace, looking out for the approach of day.

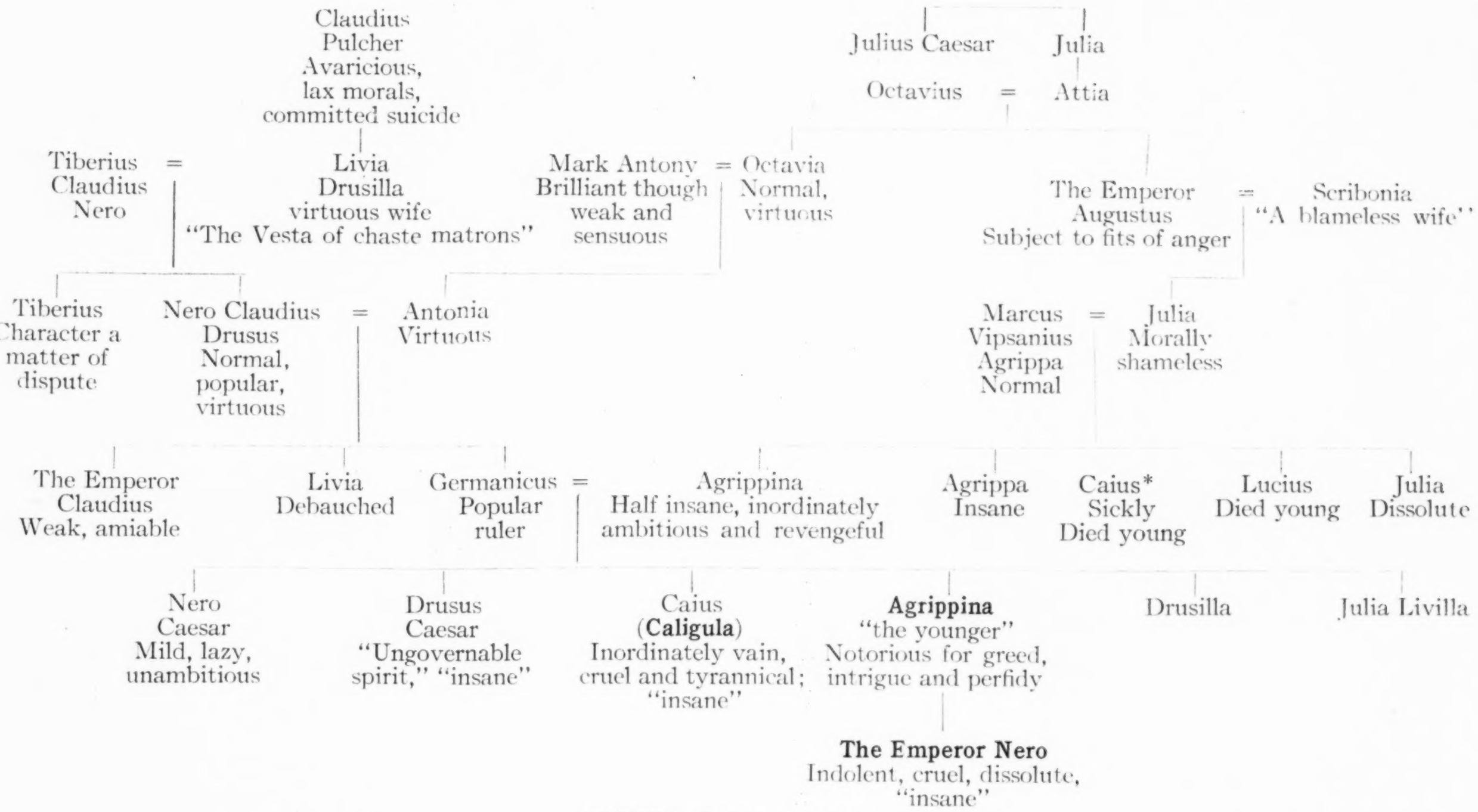
THE TYRANT

"Almost from the moment that he arose from his sick-bed, Caius behaved in a manner the reverse of his previous conduct. Some of his actions were certainly those of a madman, but he had intervals of sense, though he never again returned to the amiable mood of the first stage of his imperial career. To describe in a few words the change that took place in him, Suetonius says that at first he acted as a prince, afterwards as a monster.

"At the time of his sickness he had drawn up his will in which he constituted his second sister, Drusilla, to whom he was devotedly attached, heiress of his property and of the empire. He snatched her away from her husband and associated her with himself in a manner that gave rise to scandal. She had been united to Cassius Longinus by Tiberius, but Caius apparently after his sickness, divorced her from Longinus and married her to a creature of his own, M. Lepidus, and then took her from Lepidus and startled even dissolute Rome by the declaration that he proposed marrying her. This relation —even in Rome, not squeamish as to moral scandals—was regarded as one crying out to heaven for vengeance. . . . On medals and on cameos, the heads of Caius and Drusilla appeared together; and it is possible that he would have carried his daring purpose

---

[1] A review of the works of nine different writers on Roman history.



PEDIGREE OF THE CAESARS

Nero, Caligula, and Agrippina "the younger" were the most notorious of all the Caesars for their cruelty, tyranny and perfidy. They are here shown at the bottom of the chart, very closely related.

* Trouble probably caused by a wound.

into effect, and have openly married her. But his mad career was frustrated. The unhappy girl fell ill, with shame may be, and died. Caius was plunged in a frenzy of despair.

"Unable to find rest in his Alban villa, the mad prince roved through the cities of Italy and Sicily, and let his hair grow in token of sorrow. He would thenceforth swear by no other oath than the divinity of Drusilla. . . . But now intoxicated with power and elevation, he became convinced of his own deification. . . . Philo tells us the line of reason Caligula pursued: 'If the shepherds are of a different order from the sheep they pasture, and the bullock-drivers from the cattle under their rods, then I must be distinct and superior in kind from the mortals I rule.'

"He assumed a beard of finely beaten gold thread, and passed along the streets, thus adorned, to be saluted as Jupiter; then he would appear with wings at his heels and adjusted to his cap, to represent Mercury; then with a bow and quiver, his head surrounded by flashing rays, as Apollo. It was even said that he attempted to pass himself off, in appropriate costume, as one or other of the goddesses. . . . He went about surrounded by a train of attendants, who were dressed as the ministers of the deity he was pleased to personate at the time, and his gold statue was supplied with suits of clothes which were changed daily to correspond with those worn by Caligula. He ordered the most famous statues to be brought from Greece, and then removed their heads and substituted his own for theirs. . . .

"Drunk with flattery, and with sudden succession to absolute power . . . 'abandoned himself to wine and gluttony.'"

"The inordinate vanity of Caius made him resent anyone being thought to be better than himself in any way. In his insensate jealously, he forbade the Pompeii to bear the name of Magnus and the Torquati to wear their golden torques, and the Cincinnati to flourish a curl on their temples, as hereditary badges of their illustrious families. When Ptolemy, son of King Juba, and his own cousin, whom he had invited to Rome, entered the theater in his purple robe of royalty, all the spectators rose to stare at him. This so stirred the bile of Caligula that he had him put to death. There was in Rome a very tall man who went by the name of Colossus. Caligula, observing him in the amphitheater, ordered him to be dragged from his seat and thrust into the arena, and forced to contend with a gladiator, and when he proved more than a match for this man, then with a second. On his worsting this opponent also, he commanded the tall fellow to be bound, clothed in rags, and drawn up and down the streets, and after being exhibited in this sorry plight to the women, to be then butchered. There was, says Suetonius, no man, of however mean a condition, whom he did not envy, if that man were suspected of any excellence that might excite his envy."

Such then, is the picture of Caligula. The above is but a fraction of all that is brought together—testimony in its completeness and in its corroboration undeniable and unassailed. The same may be said of Nero. Testimony remains of such a nature that historians are forced to retain the view that Nero was of a type of bestiality and cruelty rarely exhibited among the world's sovereigns.

Here, then, is our first argument in favor of the hereditary origin of the characteristics of Caligula. Many thousands of absolute rulers have existed in history. Only a very few of these have been as debased as either Caligula or Nero, yet Caligula and Nero, two extreme examples, were as closely related as uncle and nephew. We only realize how close this relationship is when we remember that all the ancestors of any man's uncle are also ancestors of his own. In addition to this is the fact that of all women in history, few, if any, can show a blacker record than Agrippina "the Younger,"

a sister of Caligula and mother of Nero. Also the mother of Caligula, Agrippina "the Elder," was, according to Baring-Gould, "probably half insane." If we are to trust the rather condemnatory Jacoby, she was "subject to uncontrolable fits of anger." Other members of the family considered by Baring-Gould to have been insane are Drusus, the brother of Caligula, Agrippa his aunt, and Julia, his grandmother, who is characterized as exhibiting "moral paralysis." All accounts agree as to the shamelessness of Julia's life. Indeed she is one of the most notorious women mentioned in Roman history. The insanity that ran in the family, the epilepsy (inherited perhaps in the combined strains from Julius Caesar), the concentration of the family degeneracy, in the pedigree, in the persons of the above three—Caligula, Agrippina "the Younger," and Nero—combine to make a very strong case for causation through defective germ-plasm. But it is not by any means the concatenation of insanity and moral depravity shown in the pedigree of Caligula that compels us to conclude that his exaggerated traits were the product of inborn defects ultimately traceable to the chromosomes of germ-cells. All our modern discoveries in heredity point toward the far-reaching principle of segregation of unit characters, more or less definite, and sufficiently clear-cut in outline, or in the nature of their substance, to be spoken of as traits. Here good characters alternate with bad. If environment were the chief cause of the depravities of some of the members of the Claudian and Julian branches of the house of Caesars (shown on the chart) we should not expect to find their close relatives failing entirely to exhibit any such defects.

VIRTUOUS MEMBERS OF THE FAMILY

Nero Caesar, uncle of Nero and brother of Caligula, is characterized as mild, easy-going and unambitious. He is a contrast to his notorious kinsmen, and in character he resembles his father, Germanicus, his uncle Claudius and his grandfather Nero Claudius Drusus. The chart shows that a number of the women in both branches of the family were, as far as can be known, both normal and virtuous.

The old idea that degeneration in families is due to the environment in which they have lived has got to be given up. The modern view that acquired traits are not transmitted is enough in itself to negative such a notion. But the principles of the transmission of hereditary traits, as we understand them today, explains much that has happened in human history—pure transmissions, combinations, segregations, all obedient to the law of averages. It would seem that nearly all the misery brought into the world by Caligula and Nero came about because a defective royal strain was allowed to perpetuate its kind. If royalty and its culmination, Caesarism, are to be feared, how very important it must be to guard against the formation of such breeds, before their existence has made their control impossible. Tyrants work insidiously. The growth of their power is gradual and their own subjects seldom notice the conditions imposed. Exploitation of the masses is easy, for man is naturally an exploitable animal. The fashion of obedience becomes established, so that, more and more, all individualism is discouraged, and command from a superior in rank is the touch-spring of action.

The latest Caesar has seemingly been eliminated, but Caesarism will rise again as long as the laws of heredity continue to act. Power will seek to mate with power and the majority of mankind will remain as an exploitable mass. No laws of man can change the laws of nature. The best that man can do is so to direct these laws of nature that the dangerous breeds shall be kept at a minimum. The evil influences of the baser elements, and the need for restriction of undesirable elements among the poorer classes have been widely rec-

ognized, but the need for public control of the mating of sovereign houses has scarcely been realized. Nor is it likely to be realized at the present day. But the argument is there, nevertheless. If Caesarism must be abolished, and if despots are largely the result of hereditary forces, then the only way to eliminate despots is to regulate the sources from which they spring. It will be objected that evil tyrants may come from the middle classes—Napoleon for instance. The answer is that they do not as often come from such origin as from the breeds of kings. The argument remains just the same. As far as they *are* recast in the ancestral mold (and our increasing knowledge makes us more and more believe that important psychic differences are due to heredity) then just so far the number of despots can be reduced by a control of the marriages from which they usually originate.

Iowa Agricultural Experiment Station Annual Report, Ames, Iowa

The following is taken from the report of the activities of the Iowa Agricultural Experiment Station, submitted for the year ending June 30, 1917.

The work of the year was characterized by satisfactory progress with regard to all of the active projects of the station. Special emphasis was placed upon the following lines of investigation: Improvement of crops and live stock by breeding; improved methods of growing various farm crops and the management of soils; new and better methods of feeding and handling live stock; up-to-date methods of manufacturing and marketing dairy products; the growing and marketing of fruit and truck crops; the control of insect pests and plant diseases; modern methods for housing live stock and storing crops and up-to-date systems of farm management.

Adams Fund projects were carried on successfully during the past year on the same basis as in the preceding year. Interesting and valuable data were secured from each of the five projects listed below:

1. A study of Mendel's law in cattle breeding. (By the Animal Husbandry Section).

2. Arkansas dairy cattle improvement work. (By the Dairy Farm Section in coöperation with the Chemical Section.)

3. Apple-breeding investigations. (By the Horticultural Section.)

4. Humus investigations. (By the Soils Section.)

5. A study of humus and its relation to the physiological activities of the apple. (By the Horticultural and Soils Sections.)

During the year the Chemical Section did not coöperate as heretofore with the Horticultural Section in the apple breeding investigations. In the work connected with the humus project, particular attention has been devoted to the study of the evolution of carbon dioxide as a measure of the rate of decomposition of organic matter in the soil. Experiments were carried on which involved the treatment of soil with varying amounts of stable manure alone, and with lime. Very interesting conclusions were reached in this line of investigation.

The Arkansas cow work continues to be the most extensive investigational work carried on by the Dairy Husbandry Section. There are at this time 28 animals on hand, including the first, second and third generation grades by purebred dairy bulls.

The work on the Adams Fund projects will be continued next year practically without change.

CONTINUED

ON NEXT

ROLL

PLANT BREEDERS FIND NEW TOBACCO HYBRID

NEW TOBACCO HYBRID KNOWN AS MONTGOMERY SEEDLEAF

Seed plants after harvesting the remainder of the tobacco. This crop yielded 2,750 pounds per acre. Montgomery Seedleaf is a cross between Washington (Ohio) Seedleaf and Big Graham. They have erect leaves in strong contrast to the parent varieties, both of which are of decidedly drooping habit. (Fig. 7.)

From a series of plant-breeding tests with tobacco varieties started by the Ohio Experiment Station in 1903, a hybrid known as Montgomery Seedleaf has proven to be superior to common strains The intercross has been developed so as to increase the size and number of leaves without bringing in serious drawbacks such as weakness of stalk and susceptibility to drouth.

This variety, which has been developed at the Southwestern Test Farm, Germantown, has also been grown in a commercial manner by tobacco men in that section. The selected strain took first premium at the Darke County Fair in competition with a class of seventeen entries. In the green stage the stalks are about three feet in length.

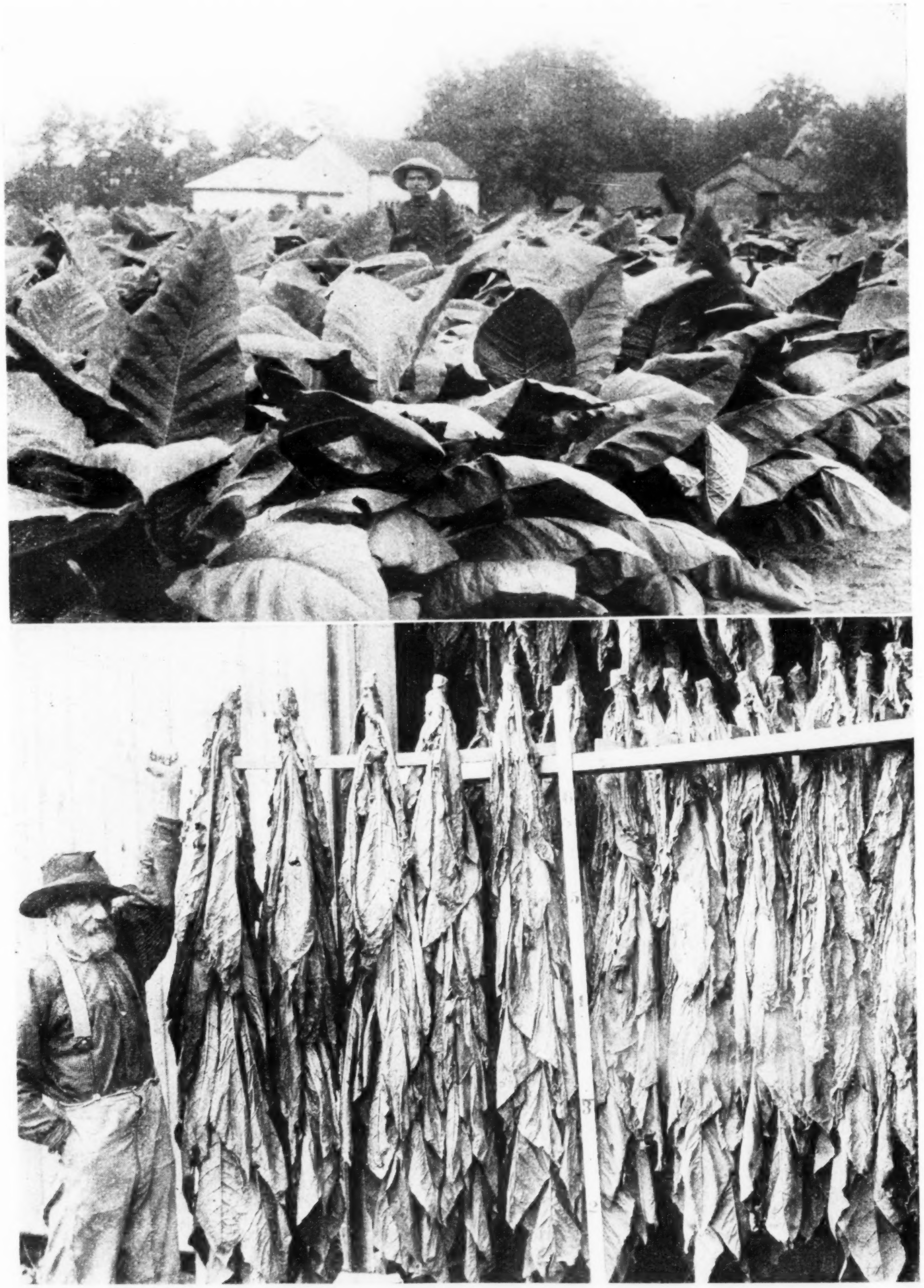
The yields of the new hybrid are superior to the common strains of tobacco, one instance being recorded of more than 2,000 pounds to the acre.

In further description of the new hybrid, Mr. True Hauser, Assistant Botanist at the Ohio Experiment Station, contributes the following to the JOURNAL OF HEREDITY:

The Montgomery Seedleaf (Hybrid No. 199) is a cross of Washington (Ohio) Seedleaf by Big Graham. The strains which are propagated have erect growing leaves, in strong contrast to the parent varieties, both of which are of decidedly drooping habit. This new variety is very drouth resistant. It does not readily bloom during severe dry weather but resumes vigorous growth after the drouth is broken. This tendancy makes it necessary, some years, to top the plants before the buds have formed. At the Test Farm we have frequently obtained yields of more than 3,000 pounds per acre and in some instances over two tons exclusive of trash.

A NEW DROUTH RESISTANT TOBACCO HYBRID

Seed plant of tobacco hybrid (Montgomery Seedleaf) on farm of Mr. True Hauser. It does not bloom readily during severe dry weather but resumes growth after the drouth is broken. (Fig. 8.)



NEW TOBACCO HYBRIDS

Upper photograph: Montgomery Seedleaf tobacco hybrid on farm of Mr. Gustavus Baughman, Ansonia, Ohio. Yielded 2,640 pounds per acre in 1913. Lower photograph: Partly cured hybrid on farm of Mr. True Hauser, Germantown, Ohio. (Fig. 9.)

VARIABILITY IN THE RADISH[1]

Excessive Variation of Root Crops Handicaps Commercial Grower—Careful Selection Should Secure Constancy—Seed of Ideal Types Should be Selected

E. Eugene Barker and R. H. Cohen

New York State College of Agriculture, Cornell University, Ithaca, N. Y.

ALL the root crops used as vegetables show great variability in most of their characters, especially in size and shape. This is true even in those kinds and varieties which are supposed to be most true to type. The best seed obtainable from the most reputable firms is subject to this same fault.

This study was undertaken with the purpose of obtaining some accurate data as to the exact amount of variability in a representative kind of root vegetable. It was also desired to ascertain what genetic factors most affect the yield. Three standard commercial varieties were obtained from a seedhouse of good reputation. Two of them, Scarlet Globe and White Box, were supposed to reach marketable size in four weeks from the date of planting, while the third variety, White Icicle, was a six-weeks variety. Four hundred seeds of each variety were planted 2 inches apart in rows in apparently uniform soil in the garden. They were planted about the middle of July and were harvested and the data taken after growing four and six weeks, respectively. Owing to very hot and humid weather that prevailed during this time, they were all much overgrown for market size. Their coarse, pithy quality was due to the same causes. This was especially marked in the White Icicle variety whose final two weeks of growth were excessively hot.

THREE VARIETIES DIFFER GREATLY

The three varieties differed greatly in regard to germination. (Fig. 10.) From 400 seeds of each variety, Scarlet Globe germinated 246 seeds or 61.5%, from which were obtained only 176 roots that could be considered marketable; White Box germinated 240 seeds or 60%, from which were obtained 236 roots of marketable size; and White Icicle 320 seeds or 80%, from which were obtained 276 well-formed roots of the typical White Icicle shape. The remainder, which were discarded, were not true to type, 33 of these being "rogues," apparently of a different type, and 11 failed to produce any good root at all.

An interesting condition came to light in the White Box variety, indicating that careless selection had been practiced in saving the seed. A few dozen plants were about to bloom or had already come into flower when the roots were dug. The roots of these precocious plants were all long and thin and not at all suitable for eating. About one-fourth of all seeds of this variety planted produced such roots. These were discarded which accounts for the peculiar distribution for weight in the White Box variety, which is seen to be entirely on one side of the mode.

IDEAL SHAPES CHOSEN

The measurements taken on each variety were weight in grams and length (exclusive of the tap-root) and greatest thickness in millimeters. The Scarlet Globe and White Box varieties are ideally globular in shape; while the White Icicle is ideally long cylindric. In order to have a standard constant

[1] This study was carried out by the junior author during the summer of 1917 in the Plant Breeding Garden at the New York State College of Agriculture, Cornell University. All data were taken and statistical computations reckoned by him.

Paper No. 71, Department of Plant Breeding, Cornell University, Ithaca, N. Y.

for shape, an index was reckoned by dividing the length by the width. This index should be 1 for the two-round varieties because the length and width should be equal; the index for White Icicle should be somewhere between 4 and 5, because the length of this variety exceeds its width. The mean index for Scarlet Globe was 1.35, the mode falling at 1.02 which indicates that this variety was too long for the ideal shape. Only 21 out of 176 roots were really true to type, having an index of 1.00. White Box had a mean of .97—very close to perfect, but the mode or class of greatest frequency was at .86. Thus the greatest number of uniform shape were too short or oblate. Only 20 plants out of 236, or 8.47%, were ideal. White Icicle had a mean index of 4.25, the mode falling at 4.32.

SCARLET GLOBE EXTREMELY VARIABLE

Scarlet Globe was extremely variable in its shape, as shown not only by its coefficients of variability of 25% and 23%, respectively, for length and thickness, but especially by that for index of shape, which was 90.39%, as against 21.96% for White Box and 26.55% for White Icicle. Scarlet Globe also showed indications of comprising more than one genetic strain for length, as indicated by its several modes. The larger of these modes nearly coincided with the mean or average of the population.

It will be seen from inspection of the accompanying table of constants, which will show, perhaps, better than a discussion, that there existed a great amount of variability in all three varieties in regard to weight, length, width, and general shape. (Appendix, p. 384.)

Weight was the most variable character in all three varieties, the coefficients of variability for this character in Scarlet Globe, White Box, and White Icicle being, respectively, 49.15%, 66.72%, and 55.34%. The difference between the mean or average and the mode or weight of greatest frequency shows how far from uniform these samples were. In Scarlet Globe the greatest frequency was found to be at 10.5 grams, 17% of the whole number of roots occurring in this class, although the mean or average of the population was 12.58 grams. In White Box the mean was 17.22 grams, but the greatest number of roots of uniform weight fell in the class 3.8 grams. This lightweight class comprised 18.35% of all the roots. In White Icicle with a mean of 47.59 grams, the largest class of individuals was at 30.5 grams, and constituted 12.31% of the whole population.

LENGTH AND THICKNESS VARY

As to the length, we find the first two varieties both 25% variable, and the third one 27% variable. While the mean and mode run fairly close together in all cases, we find that only about 13% of the whole population in any case is approximately the same length as the average.

Essentially similar conditions exist in regard to thickness, and variability as to general shape runs from nearly 22% in White Box to as high as 90.39% in Scarlet Globe. This is a very undesirable condition in a crop that is grown to be harvested all at the same time, and where uniformity is an important feature in the attrativeness of a bunch of radishes in the market.

In order to ascertain which factor was more important in influencing weight, whether length or thickness, each of these dimensions was correlated with weight. As can be seen by the table (see appendix), width was far more important than length in Scarlet Globe and White Box, the coefficients of correlation being 88% and 90%, respectively, as against 65% and 82% when length was correlated with weight. Length was slightly the more influential factor in White Icicle, the long variety, as shown by correlation coefficients 88% for length as against 87% for width.

COMMERCIAL APPLICATION OF RESULTS

The results of this little study are interesting in the light they throw on the existing conditions of commercial varieties of one of our common vege-

THREE STANDARD COMMERCIAL VARIETIES OF RADISH

At left is a specimen of the long White Icicle variety. In the center is a White Box. On the right is a Scarlet Globe.
All are very variable but can be improved by scientific methods of election. (Fig. 10.)

tables. While it cannot be claimed that the constants here obtained would be found in other samples of seeds that might be obtained elsewhere or grown under different circumstances, or that they are approximately true for other varieties of radish, or other root crops, nevertheless, most growers of vegetables would admit, I believe, that conditions found in this study are fairly representative of general conditions in this group of vegetables. It is well known by growers that much of the seed planted is not viable, that a large portion of the crop is not true to type and must, therefore, be culled out as unmarketable, and that there is great variability as to rate of growth and time of maturity. If data were obtainable on quality and color of flesh, it is not to be doubted that the variability in those characters would be any less than in these here studied. It is realized that much is to be desired in constancy of all those characters upon which the commercial value of kinds and varieties of vegetables depend.

This excessive variability is easily to be explained by the methods of selection generally practiced by seed growers. Sometimes seed is saved from those plants which are most vigorous or first come into bloom (as was apparently the case in White Box), and seldom is careful attention given that the root shape be very true to ideal; moreover, mass selection is used, whereby the less desirable characters, often lying hidden and latent, are kept along with the most desirable characters of the best selected plants. There are two chief reasons why it is difficult to practice careful selection in such crops. First, that part of the plant where constancy to type is desirable lies out of sight in the ground. To dig and select these roots at the time they are marketable would be fatal and no seed could be obtained from them. In the second place, the plants, as grown for commercial seed production, are left to open pollination, with plenty of chance for cross pollination with poorer individuals or even with different varieties. This is a fault hard to obviate in commercial practice, because the radish does not readily set seed when the flowers are covered, and the flowers usually need manipulation to insure self-fertilization.

SUGGESTIONS FOR SELECTION OFFERED

The following suggestions are offered as possible and practicable methods of selection for securing better trueness to type in such crops. First, determine what is the ideal type as to shape, size, length of season, etc., for the particular kind and variety. Then carefully select a few plants which closely approximate this ideal at the time they should be ready for harvesting or for market. This could be done by removing the earth carefully from about the roots long enough to observe them and then quickly replacing it around those plants which are found to be close to standard. These only should be retained and allowed to set seed. Varieties likely to cross should not be planted near together. The seed from each of these selected plants should be sown in separate plats or rows, and no seed should be saved from this generation except from those plats or rows which show greatest constancy to the type for which their parent was selected.

Another method of breeding that might be suggested would be to grow the plants as pseudo-biennials; that is, to let the roots attain marketable size, then dry them off and dig them. They could then easily be measured, and could be stored until the beginning of the next growing season. It would be possible to do this under controlled greenhouse or irrigation conditions, or possibly, by planting so late in the season that growth would be checked at the right stage by the advent of cold weather. The seed obtained from these plants during their second growing season should be planted in separate rows or plats from each plant. The seed from all the plants in each row or plat might be harvested all together, but unless each row or plat subse-

quently proved to be uniform and close to standard, its seed should be discarded.

The general amount of variability might quickly be reduced if these methods were put into practice, and by repeating the selection of a few ideals individuals for several seasons and isolating them into separate plats or rows, a variety or strain of great constancy and perfection of type might be obtained.

Genetics in Relation to Agriculture[1]

Babcock and Clausen's New Book Reviewed

The object of the authors in preparing this book is well stated in the preface as an attempt at "an adequate presentation in a single text of the facts and principles of genetics and their practical applications." The reader will concede that in this attempt the authors have been successful to a very gratifying degree. They have done an immense amount of work in bringing together the results of investigations and have apparently omitted nothing of importance. While the book will be of transcendent value to the undergraduate student of genetics in that it will present to him the subject as a connected and logically arranged whole, the very complete manner in which the important work that has been done along this line is covered will make the work of preeminent value to the investigator.

The work of the authors is characterized by great care in stating facts and giving the opinions of others. It is gratifying to find, however, that they do not hesitate to state their own opinions on points which are in dispute. The fact that in doing this they are also able to give what appears to be an eminently fair statement of the arguments on both sides is a matter on which the authors deserve congratulation.

The authors of this book do not make the mistake of assuming that the science of genetics is the only phase of knowledge required by the successful breeder. They make clear to the student that the work of the breeder is an art which includes much more than a knowledge of the principles of genetics.

Considering the volume of the text, which covers more than 600 octavo pages without the glossary, list of literature and index, the number of errors in this first edition must be considered remarkably small.

The book is divided into three parts, the first of which deals with Fundamentals, the second with Plant Breeding, and the third with Animal Breeding. It must be conceded that this is the most adequate presentation of the subject of genetics that has yet appeared. Part III, on animal breeding, however, is not so adequate as the two preceding parts. While the scientific aspects of animal breeding are well presented, the text of this portion of the book is not characterized by the intimate knowledge of practical animal breeding shown in Part II on plant breeding. Nevertheless, it is a book which the practical breeder of animals cannot afford to be without.—W. J. Spillman.

---

[1] By E. B. Babcock and R. E. Clausen. New York: McGraw-Hill Book Company. 1918. Pp. xx–675, 4 plates.

BUD VARIATION IN DAHLIAS

A. D. Shamel, *Riverside, California.*

DAHLIAS are propagated commercially by cuttings. They are sometimes propagated by division of the roots and by grafts. In a very limited way, mostly eperimentally, they are grown from seed.

There are a very large number of varieties of the dahlia in cultivation in the United States and abroad. Wilhelm Miller states, in Bailey's Cyclopedia of Horticulture, that over 3,000 different names of dahlia varieties have been published in catalogues. In this respect the dahlia resembles the chrysanthemum of which a very great number of varieties are listed in commercial catalogues.

Some of the authors of discussions of dahlia varieties seem to have fallen into the error of assuming that the numerous varieties must of necessity have originated from seedlings. Such is not the case. The writer believes that bud variation has been responsible for the origin of many of the most valuable varieties of dahlias. Here again, the writer believes that the dahlia resembles the chrysanthemum. As pointed out by Cramer a great part of the cultivated varieties of chrysanthemums have originated from bud variations. The commercial methods of propagation of the dahlia and the chrysanthemum are similar. In both cases variable plants arising from cuttings have been propagated by growers. The beautiful and striking variations have been multiplied by the use of cuttings and introduced as distinct varieties.

Darwin states under his discussion of Bud Variation, "Dahlias propagated by tubers under the hot climate of St. Domingo vary much; Sir R. Schomburgk gives the case of the 'Butterfiy variety' which the second year produced on the same plant double and single flowers; here white petals edged with maroon; there of a uniform deep maroon. Mr. Bree also mentions a plant 'which bore two different kinds of self-coloured flowers, as well as a third kind which partook of both colors beautifully intermixed.' (1832.) Another case is described of a dahlia with purple flowers which bore a white flower streaked with purple." (1842 and 1850.) It can be seen from the above statement that bud variation in the dahlia is no new or recent phenomenon.

From a recent inquiry (1918) amongst Southern California dahlia growers striking bud variations in dahlia plants propagated from cuttings, are said to be of common and frequent occurrence. Occasionally, two or more kinds of flowers occur in the same plant. In many cases local gardeners have isolated the interesting and valuable bud variations of the dahlia and propagated them as new varieties.

The facts are, that all of the varieties of local origin which the writer has investigated have been originally discovered as variable plants, or branches of plants, in plantings of established varieties. Therefore, they have originated from bud variations. It seems likely that a great many of the established varieties have originated in the same way, as is apparent from the manner of propagation. Therefore, bud variation has been a most important factor in the improvement of the dahlia.

One of the striking bud variations of dahlia plants observed by the writer this season in Riverside is shown in Figs. 11 and 12. The name of the

CURIOUS MIXED-COLORED DAHLIAS

A dahlia plant bearing white, purple, and mixed white and purple flowers. The leaves also show interesting bud variations, varying from entire, two-parted, to three-parted forms. (Fig. 11.)

variety in which these interesting bud variations occurs is unknown. The plant ilustrated in Fig. 11 has shown similar variability for five years. It grew from a cutting. There are three kinds of flowers borne by this plant, as can be seen in Fig. 11, pure white, purple, and mixed white and purple. In the mixed flowers some of the petals are almost exactly half white and half purple. The plant is perfectly healthy and vigorous in growth and the flowers are particularly beautiful and ornamental.

DAHLIAS OF VARIOUS COLORS ALL FROM ONE PLANT

Typical flowers from plant shown in Fig. 11. The form and arrangement of the petals in the white flowers are different from that of the purple flowers. The writer believes that bud variation has been responsible for the origin of the most valuable varieties of dahlias. (Fig. 12.)

EFFECT OF WAR ON CRIME, MARRIAGE AND INSANITY

War Decreases Crime and Insanity—It Increases the Marriage Rate, but Decreases Birth Rate and Also Infant Mortality—Its Effect on Illegitimacy

---

PROFESSOR J. A. LINDSAY has published in *The Eugenics Review* for October, 1918, some valuable facts bearing on the much discussed, and but little investigated question—the relation of war to eugenics. He first takes up the mere matter of the number of persons killed and the time necessary to repair the losses. Here Professor Lindsay quotes Savorgnan who published a detailed calculation in a recent number of *Scientia*, arriving at the conclusion that England will require ten years, Germany twelve, Italy thirty-eight and France sixty-six years before recoupment can be expected.

"It is probable that the views here expressed do not err on the side of optimism, and they serve to bring out in lurid light the vast holocaust of the nations which is now in progress. There has been nothing like it since the Black Death of the fourteenth century, which is believed to have carried off twenty-five million victims. F. Savorgnan's general conclusion is that about the year 1930 Germany and England will have made good their losses in manpower, but that Italy will require much longer, and that the prospect before France is very grave, as her population before the war was practically stationary. He thinks the difficulty of France will be partially met by a large immigration of Italians and Spaniards, who are traditionally prolific, and who will ally themselves with French women, the tendency being towards the formation of a solid Latin block.

"The population of England and Wales, according to the usual computation, increased a little more than a million in the course of the seventeenth century, nearly three millions in the course of the eighteenth century and no less than twenty-three millions in the course of the nineteenth century. If this rate of increase should continue, it is reckoned that 300 years hence England and Wales would have a population of 1,400,000,000! There is evidently here matter for serious thought."

THE MARRIAGE RATES INCREASE

"Closely related to the question of man-power, as affected by the war, are the questions of marriage rates, birth rates, and death rates. As regards the marriage rate, it is well known that in early days of the war "war marriages" were numerous and popular, the marriage rate for the quarter ending September 30, 1915, being the highest ever recorded for England and Wales, viz., 21.8 per 1,000, and for the whole year 19.4 per 1,000, as compared with 15.4 per 1,000, the average figure for the previous ten years. Sir Bernard Mallet has calculated that between August, 1914, and June, 1917, there were in England and Wales 200,000 people married who, but for the war, would have remained single, and in Scotland 8,000 such persons. In Ireland there was no increase in the marriage rate. The motives for war marriages are various and of varying degrees of validity. Sentiment, the outflow of female sympathy for men risking their lives, in the defense of their country, accounted for some. Parental caution regarding financial security was naturally less stringent in war time. But motives more definitely eugenic were also at work. The desire for heirs, fears for the extinction of ancient families—such motives operated and were worthy of respect. Naturally, the high marriage rate could not be maintained and soon tended to fall.

The rate for 1916 was 14.9 per 1,000, being 4.5 per 1,000 below the phenomenally high rate of 1915, and the figures for 1917, so far as they have been ascertained, indicate a further decline."

THE BIRTH RATE DECLINES

"War, for obvious reasons, tends to depress the birth rate. In invaded and devastated regions the whole machinery of family life is disorganized, and the birth rate falls to one-half or even less of the normal figure. This has been the case in parts of France, Poland, and elsewhere. In Bavaria the birth rate of 20.7 per 1,000 in 1913 fell to 15.8 per 1,000 in 1915. In England and Wales the rate of the last quarter of 1915 was 19.5 per 1,000, the lowest on record. Thereafter there was a rise in the rate, we may presume as the consequence of "war marriages," which for the quarter ending September 30, 1916, stood at 21.7 per 1,000. For the whole year 1916 the rate was 20.9 per 1,000, being 4.6 per 1,000 below the average of the decennium 1905-14, and 1.0 per 1,000 below the rate for 1915. Sir Bernard Mallet calculates the reduction of natality in this country due to the war at 12% in 1916, as compared with 1914, and points out that most of the belligerent countries have suffered much more severely. Whether the progressive decline in the birth rate which has been operative in this country for half a century will continue after the war cannot be affirmed with certainty, but probability points in that direction. How far this tendency is evil is a question upon which there is at present much difference of opinion."

INFANT MORTALITY DECREASES

"Infant mortality has shown a remarkable decline in England and Wales during the war. The rate for 1916 was 91 per 1,000 births, being 19 per 1,000 below the rate for the preceding year, and 22 per 1,000 below the average of the decennium 1906-15. Until we see whether this decline will be maintained, it is somewhat premature to speculate on its causes which are not clear."

"Experience in France after the war of 1870, and in America after the Civil War, shows that the diminution in crime in time of war is followed by a large recrudescence of crime in the after-war period. The causes of this increase are sufficiently obvious. The relaxation of military discipline, the reaction from the privations of war, the breaking up of homes, the uncertainty of employment, impatience with the monotony of industrial life—such factors are obvious and must be reckoned with as tending to crime. War is a good school of the virile virtues, but it is hardly a school to inculcate increased respect for the lives, property and rights of others."

JUVENILE DELINQUENTS

"While crime generally has notably declined during the war, it is disquieting to find that there has been an increase of juvenile delinquency. From England, Scotland, and France, there is the same report of an increase in the number of first offenders."

WAR DECREASES INSANITY

"A very unexpected feature of wartime has been the decline of insanity. That this decline is real and not merely statistical seems to be the opinion of those best qualified to judge. Robertson of Edinburgh is of opinion that the war has acted as a mental tonic. He could trace no increase in insanity due to the war, but regarded dabbling in spiritualism as dangerous to certain mental types. Easterbrook of Crichton Royal found only 19 cases of insanity due to "grief," and was of opinion that war had "only exposed and accentuated inherent weakness." Carre of Glasgow reported only nine cases of insanity due to the war. Robertson thought that the fall in the female statistics was due to women not being so "shut in" as before. Graham of Belfast reported a decrease in the number of insane and expressed the view that "it is not the great tragedies of life that sap the force of the brain and wreck the psychic organism. On the contrary, it is the small worries, the deadly monotony of a narrow and circumscribed existence."

The above facts admit of only one interpretation—viz., that war, fruitful though it is in shock cases and neurasthenia, does not increase, but may even tend to diminish, insanity.

WAR DECREASES SUICIDE

"A remarkable and unexpected result of the war has been a decided decline in the rate of suicide. In the ten years 1901-10, the average number of male suicides was 157 per million living. In 1914 the figure was 151 per million, while in 1915 the figure fell to 104 (civilians only), and in 1916 it stood at 111. Amongst females, as might be expected, the fluctuations were much less marked. The female rate in the decennium 1901-10 was 47 per million living, in 1914 and 1915 it was 45, and in 1916 it was 38. These figures are a further indication that the effect of the war upon the mental stability of the nation has been tonic, rather than depressant."

THE WAR AND ILLEGITIMACY

Another aspect of the war in relation to eugenics is treated by Emma O. Lundberg in an exhaustive article in the *American Journal of Physical Anthropology* for July-September, 1918.

The writer has gathered comparative data on the rates of legitimate and illegitimate births based, respectively, on the total number of married women, and the number of unmarried, widowed or divorced women in the various countries of Europe. "These figures are of interest as showing the trend of the general birth rate over a period of years, the illegitimacy birth rate over the same period, and a comparison of the two. The most striking thing brought out is the regularity of the absolute decline, not only of the legitimate birth rate, but of the illegitimacy rate as well. With the exception of Ireland, all the countries for which we have figures covering from 30 to 40 years, show a decrease in the number of legitimate births in comparison with the number of married women of the age inclusion. There was a similar decline in the ratio of illegitimate births to the number of unmarried women in all of the countries except France and Sweden; in the first of these countries the rates were stable, and in the second there was an increase. In Great Britain and Bavaria, while the rates indicate an increase, there was an actual decline in the number of illegitimate births. Other countries in which there has been a progressive decrease in the number of illegitimate births annually are Austria, Belgium, France, Great Britain, Italy, Norway, and the Netherlands. Increases in the annual number of illegitimate births during a thirty to forty year period have occurred in the German Empire as a whole, especially in Prussia, and in Bulgaria, Denmark, Finland, Bosnia and Herzogovina, Hungary, Portugal, Roumania, Russia in Europe, Serbia, Sweden, and Switzerland.

In the social changes that came when Europe was plunged into war, old customs were uprooted, the existing order was disturbed, and revolt against conservative ideals seemed likely to alter the standards that society had sanctioned. The economic and social relations of the sexes were altered; artificial distribution of population resulted from concentration of men in army camps; emotional disturbance was a part of the war excitement; the growing independence of women, economically and socially, forecast freedom from restraints. On the other hand, the added responsibilities and the seriousness of the times, the greater individual freedom of women, and the general absence of leisure time, might be presumed to have counteracted these conditions to a considerable extent. Also, we must take into account the increased number of marriages early in the war, and the large proportion of the men removed to the front.

In England the Registrar-General has called attention to the fact that the war has produced no perceptible effect on the statistics of illegitimate births, in spite of predictions current in the early months of the war.

THE TESTING OF A NEW TREE CROP FOR HARDINESS

DAVID FAIRCHILD

Agricultural Explorer in Charge of Foreign Seed and Plant Introduction, U. S. Department of Agriculture, Washington, D. C.

IN A REGION like that of the Gulf States where there is a great range in the minimum temperature from year to year, it is not a simple thing to determine whether a tree crop of some new introduction can be grown there or not. There are so many factors and they are so complicated and their solution runs away with so much of an investigator's life that it is almost a discouraging business to attempt to test out a new tree crop in a new region. It must be done though, and in the doing of it, those of us whose business it has been to do this kind of work are learning a few things which it seems to the writer are worthy of recording for the next generation of experimenters. This brief note is intended to cover only one feature of the difficulty which attends this kind of work, viz., that which has to do with the protection of the young plants through their babyhood and at the critical times when in our Gulf States in particular every new tree runs the supreme danger of death from freezing.

Young trees like young people are more tender than the grownups and the little baby trees, which, when they are fully grown will weather severe freezes, are often killed outright by light frosts and never get a chance to prove their ability to stand the cold.

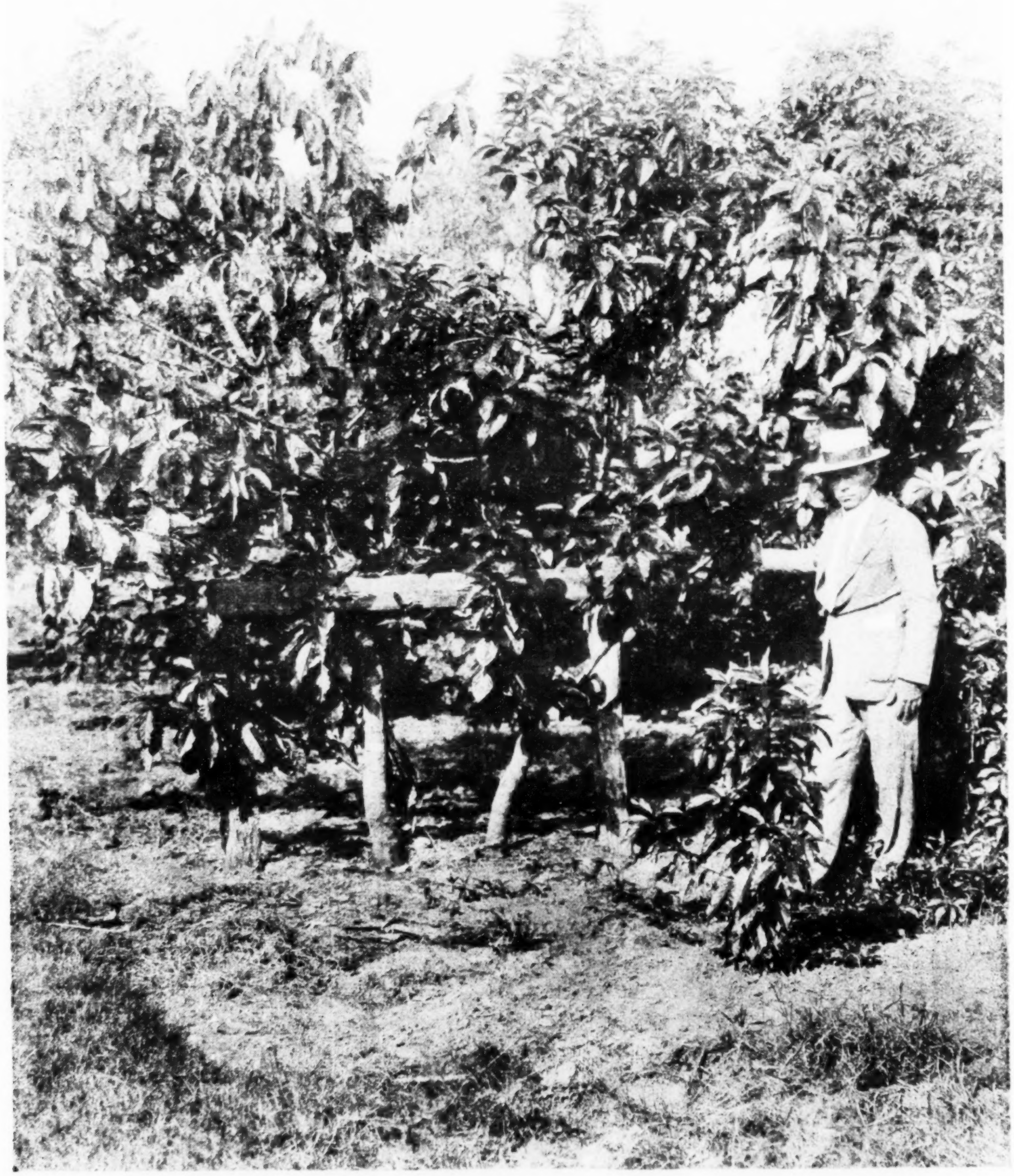
Through a series of years those of us in the Office of Plant Introduction who are interested in the problem have been watching some experiments in the acclimatization in Northwestern Florida of the hardier or Mexican type of avocado.

One of our field stations is located at Brooksville, in that remarkable hammock region of Western Florida where the soil conditions appear to be favorable for the growth of the avocado and it was at this station that the tests were made. The climate of Brooksville during all but a very brief period is of a character favorable to the growth of this tree, but there are short periods, usually in the month of February, when for a few nights the thermometer drops, if there is no wind, to even as low as 18° F. The temperature does not remain there for more than a few hours, but long enough to devastate a garden of tropical plants so completely as to discourage any but the real pioneer in plant introduction. It is a strange experience to wander through a garden upon which one has spent years of thought and labor and to find that during a few hours just before dawn the pets which were so promising and appeared in perfect health, have wilted and are actually dying before your eyes. This is the experience of the pioneer in plant introduction.

I remember in 1898 visiting West Palm Beach where my former professor of horticulture, Prof. E. Gale, had gone in the eighties to study the tropical mango during the last years of his life. He took me out into his little garden and showed me there the original Mulgoba mango tree which had been killed down to the ground on two occasions but which was at that time ten feet high, branching at the ground as all trees do which are cut back by the frost. I could not then fully appreciate Professor Gale's confidence in the future of the mango at Palm Beach and

TESTING THE HARDINESS OF THE TROPICAL AVOCADO TREE BY PROTECTING IT FROM FREEZING WHEN YOUNG

On left row of Mexican Avocado seedlings as they appeared after being injured severely February 20, 1916, by a temperature of +24° F. nine months after planting. Had the temperature gone a few degrees lower, these little trees would have perished in infancy. In middle: the same row after recovering and making a season's growth, *i. e.*, in November, 1916. On right: the same trees a few months later (February 2, 1917) after a freeze of +18° F. had killed back the trees to within a foot of the ground, notwithstanding the fact that they were protected with straw or hay and burlap wrapped around them (note covered tree in left hand corner). Had these not been protected they would have been killed by the lowest temperature which has visited the region in twenty years. (Fig. 13.)



AVOCADO TREES WHICH, AS A RESULT OF PROTECTION WHEN YOUNG, SURVIVED THE LOWEST TEMPERATURE OF TWENTY YEARS

These three Mexican Avocado trees are some of those shown in the previous plate. They prove what can be done in the way of bringing to maturity a tender tree on the northern border of its range, if frost protection is given to it at the right time. The right hand tree bloomed November 27, 1918, three years and six months after the seed was planted. (Fig. 14.)

it was not until ten years later that I visited the same spot and walked under this same Mulgoba mango tree the branches of which stretched ten feet above my head and the trunks of which were as large around as my thigh.

Professor Gale had coddled his little tree, and by protecting it during the freeze had kept it from being killed back quite to the ground, and when it became fully grown the freezes could not do more than severely prune it, for the thick bark and the protection of the branches were sufficient to keep out the cold from the growing inner bark or cambium.

This experiment established the practical limit of mango culture in Florida, and although the freezes come too often to make commercial mango-growing a profitable thing around Palm Beach there are hundreds of trees there and they bear delicious fruit.

In the case of the trial of the Mexican avocados which were planted at Brooksville and which went through two severe freezes, we have a rather complete photographic record and it is the main object of this note to publish these photographs and give some idea to those who have not had the experience themselves, of how a little care given to a row of seedlings is repaid by the growth of good trees which stand a chance of weathering the severest weather of the region. In June of 1915 there were sent to the Brooksville garden a hundred or so seedling trees only a few inches tall and they were put out in a nursery row. Arrangements were made to protect them during the following winter but the man in charge of the garden was not familiar with the climate and he failed to cover them and the result was that although the thermometer went down to only 24° F. at the garden, which will not injure the Mexican avocado when fully grown, a large share of the little plants succumbed and the rest were severely cut back. On February 20, 1916, immediately after this first freeze, they appeared as shown in Fig. 13.

During the following summer these trees grew and made a strong, vigorous growth and by the following November appeared as in Fig. 14.

These young trees were already large enough to excite attention and when the danger season approached Mr. J. E. Morrow who in the interim had taken charge of them saw to it that they were thoroughly wrapped with straw and over this straw a wrapping of burlap was put as shown in Fig. 13. The temperature went this time to 18° F. and killed outright every tree in the row which had not been properly wrapped to protect it and even with the protection afforded by the burlap and the straw these young trees were killed back to a foot or two above the ground (Mr. Morrow's thumb in Fig. 13 marks the height of the living wood as it appeared on February 2, 1917). By the following December these trees had made a very rapid growth and one of them appeared as shown in Fig. 14 which was made from a photograph taken December 17.

In the course of the following summer this tree had grown into a good-sized specimen, one which any owner would have been proud of and it stands a really good chance during the coming winter of weathering any freeze which is at all likely to visit the region. Owing to the nursing care which Mr. Morrow gave to these seedling avocado trees we have now arrived at a positive result which is a very different thing from the ordinary negative result which might for years have discouraged anyone from even the attempt to grow the Mexican avocado as far north as this point on the west coast of Florida.

In the early days of Florida there were thousands of failures reported. It was always a difficult matter to sift out those which really indicated an unsuitability of the plant to the climate from those which merely represented infant mortality through neglect to protect during the danger period.

Environmental Factors and Hereditary Differences Influencing Fruiting of Cotton

IN 1911, observations were begun by E. C. Ewing at the Mississippi Experiment Station in a study of the processes by which the fruit is normally set and matured in American Upland cotton in that locality. "The project also contemplated a study of the differences in the fruiting processes displayed by different varieties growing under similar conditions. The object of the investigation was to obtain a better understanding of the seasonal history of the cotton plant for consideration in the light of the information already available in regard to the life history and habits of the cotton boll weevil, and especially to determine the nature of varietal differences in the fruiting processes. In the same year experiments were started with the view to the improvement of varieties and the production of new varieties for culture under boll weevil conditions. This effort to take stock of the material and qualities available in the existing varieties then appeared essential for the proposed cotton-breeding work.

"The fact that boll weevils usually emerge from hibernation in numbers relatively small as compared with the numbers appearing in late summer and fall and that only the early fruit can mature uninjured in infested fields, pointed in the early experiences with the boll weevil to the importance of earliness as a varietal characteristic in cotton to be grown under boll weevil conditions. But from the nature of the cotton plant it became evident that earliness is a rather indefinite matter, that hereditary qualities might contribute to earliness, and that these qualities might be closely related or might be independent of one another. These and numerous other collateral questions have been studied, and the results and conclusions are comprised in this report. [*Technical Bulletin*, No. 8, Agricultural College, Mississippi, June, 1918, pp. 93.]

THE QUESTION OF EARLINESS

"The effects of external influences, including certain cultural factors, have been referred to under several headings, and the hereditary qualities which constitute varietal differences in earliness have been discussed to some extent. In that discussion it was pointed out that a variety might be early in one way and late in another. For example, two varieties planted and grown alike may produce their first flowers on the same date, in which case they are equally early in one phase of earliness, initial flowering. But more time may be required for the bolls of one of these varieties to develop than for those of the other. If the mean boll period at the beginning of the fruiting season is forty-five days for one variety and fifty days for another, then the first bolls of the former should open five days earlier than those of the latter, although the first flowers appeared simultaneously in both varieties. Then the amount of fruit set within a given period, say thirty days after flowering begins, depends first on the mean rate of flowering, one or two or three flowers per day as the case may be, and second, on the percentage of these flowers lost through shedding. The last two factors also, of course, help to determine the rate at which the bolls open in the autumn and the relative earliness of the crop of any variety. Thus, these four factors, the time of commencement of flowering, the length of the developmental period of the boll, the rapidity of flowering, or the daily rate of flower production, and the percentage of shedding, together with the mean, yield per boll, are all more or less related to the question of weevil injury and weevil

avoidance; therefore, each helps to determine the amount of the crop which will be matured by a certain date in the autumn.

THE QUESTION OF HEREDITY

"In our attempt at an analysis of the hereditary factors concerned in earliness all these factors have been studied independently and in their combined effects. It now remains to record in detail the differences which have been found in fruiting activity of the several varieties studied.

"These studies have not included any observations on the growth of the plant. Our attention has first been centered on the question of the time of opening of the first flower in the several varieties planted and grown under as nearly identical conditions as is possible with the usual methods of variety testing. With the appearance of the first flower in each variety the daily counting of all flowers produced by each variety was started. The number of plants of each variety studied was one hundred. These were divided equally among two rows of adjacent series, the varieties being planted in multiple series, each series consisting of as many parallel rows as there were varieties. Thus, in 1914, ten varieties were studied, and these were grown in twenty parallel rows, one thousand plants in all, one hundred of each variety, fifty to a row. This flower census was continued each day throughout the principal flowering season, each year from 1911 to 1914. The differences found in the flowering characteristics of the several varieties have reappeared rather consistently in the different years.

"During four seasons, 1911 to 1914, statistical studies have been made of the various fruiting process, but, as has been stated, the data obtained in 1913 have not been used for comparing varieties. In each of the other three years we have compared varieties of three groups: First, the so-called Early group, represented by such varieties as King and Simpkins, in which we have included the Trice variety; second, the so-called Big Boll group, of which Triumph and Cleveland are typical representatives; and, third, the Long Staple group, to which Columbia and Sunflower are referred. This grouping is that devised by Duggar (7)[1] and elaborated by Tyler (15),[2] and generally followed by agronomists working on American Upland cotton. No system of grouping, without an almost indefinitely large number of groups, can be made to include at once certain varieties and to exclude all others. This is due to the fortunate circumstance that certain of the dominant characteristics of the several groups are not so correlated as to be mutually exclusive. For instance, there is nothing necessarily to prevent a variety from combining the distinctive qualities of both the Big Boll type and the Long Staple type; in fact, Columbia and a few other varieties might qualify for either of these groups. Likewise it appears that a variety may be early in its fruiting habits and at the same time produce a long staple, although it has generally been believed in the past that Long Staple varieties were necessarily late in maturing their crop and slow in setting their fruit. The Express variety is one which resembles the Early group in its fruiting characteristics, and at the same time its lint is long enough to qualify for the Long Staple group. Cotton breeders are endeavoring with some success to break down negative correlations as far as they tend to oppose the combination of certain useful qualities.

"Obviously no variety combines all the good qualities in a high degree. Varieties are strong in some respects and weak in others. In choosing from the available varieties for the best cotton to grow, one can only take the kind that possesses the most advantageous combinations of qualities, but any variety selected necessarily will have some

---

[1] Duggar, J. F.: Description and Classification of American Upland Cotton, Alabama Experiment Station Bulletin No. 140, 1907.

[2] Tyler, F. L.: Varieties of American Upland Cotton, U. S. Department of Agriculture Bureau Plant, Indiana, Bulletin 163, 1910.

defects. The best way to determine what varieties possess the most effective combination of character for culture under weevil conditions is to study the results of variety tests conducted under weevil conditions. These studies reported here were made mainly in advance of the weevil infestation in Mississippi, partly with the idea in view of predicting what varieties would be most efficient in lint production in the face of weevil attack.

"Now that we have several years' experience with the weevil, these results help to explain why certain varieties are more productive under weevil conditions than others. For this reason they should be of value to the cotton breeder. It was mainly as an aid to the plans contemplated by the Mississippi Experiment Station for attempting to develop more desirable varieties by hybridization that this analysis of the fruiting processes was undertaken. The results here presented show in what varieties or in what types certain qualities may be found. Experience in field comparison of varieties and in conducting variety tests should, with the aid of these results, enable the observer to form a fairly good estimate of the important characteristics of different varieties and of the degree in which they possess certain qualities, without having to resort to detailed and laborious studies, such as these have been.

"How much can be accomplished towards the combination of the several desirable qualities of different varieties through hybridization is another question. Partial successes already obtained in this direction are a favorable indication."

Disease and Natural Selection

While it is usually assumed that various race poisons have a disgenic effect upon mankind, it has been occasionally pointed out that the effect of alcohol and venereal diseases is, in the long run, a selective process, tending to eliminate the socially and morally unfit. This latter theory is based upon the belief that the morally inferior tend, on the average, often to acquire diseases leading to sterility. In other words, there is a correlation between morality and total net offspring.

Figures supporting this idea have been very meager. For this reason a portion of the report of H. C. and M. A. Soloman, published in *Mental Hygiene*, for January, 1918, and reprinted in the Bulletin of the Massachusetts Commission on Mental Diseases (Vol. II, No. 1), has considerable interest for eugenists. These writers have been making extensive investigations into the families of the neurosyphilitic and counting the number of children born in such families. Their conclusions follow:

"No greater cause of race suicide can be imagined than syphilis. For example, of the group of 247 families eighty-four, or 34%, were sterile—had no children; of the 160 families of paretics fifty-three, or 33%, had no children. In the population at large the least productive group as to children is supposed to be the college-trained, but we find among the Harvard and Yale graduates only from 19 to 23% of infertile marriages in contrast to the 33% among paretics. It was found, further, that 20% of the families had abortions, miscarriages and stillbirths, while dead children occurred also in 20%.

"As a result we find the average of living children per family to be 1.3, a figure very much lower than necessary to keep the population stable. The figures are about the same for families in which the original patient had or had not nervous system involvement. The birth rate for the 247 families averages 1.7 children. From the United States census report it is found that the average birth rate in our vicinity is 4.4 children per family. But this difference between 1.7 and 4.4 does not tell the whole story. Were it not for syphilis the 4.4 figure would be higher, for that average includes the syphilities. But of the 1.3 living children per family, many are afflicted with syphilis and will have a shortened life and a lessened efficiency."

ROSEN RYE[1]

Heavy Yielding Variety Brought by Russian Student—Farmers Cooperate with Scientists in Keeping Up the Standard

FRANK A. SPRAGG, *Plant Breeder*, and J. W. NICOLSON, *Extension Specialist*.
Michigan Agricultural College, East Lansing, Mich.

THE Rosen Rye has a shorter, stiffer straw than is ordinary and yields about twice as many bushels per acre as the old-fashioned common varieties, because the Rosen heads are much larger and better filled. The head is not longer than the common rye, but gains in size and weight through width and density. Rye is four rowed, *i. e.*, two flowers at each joint of the rachis, alternating on the head. In the case of the common varieties only about half of these flowers are fertilized, giving a rough, loose appearance to the head. The kernels of the common rye are small and usually covered by the chaff, while in the Rosen Rye the large kernels project beyond the glumes when ripe. Typical Rosen Rye has less than 30 per cent of its heads, with 10 per cent of the grains missing. The result is that the flowers are generally fertilized on most of the heads. This gives the crop a large, square-headed appearance. In favorable years, nearly complete fertilization may extend to 99 per cent of the heads.

Rye, as will probably be remembered, is open-fertile. This accounts for the irregularity observed in the above description. In the case of autogamons (close-fertile) plants, the crop becomes a mixture of homozygotes which are easily isolated by selection and pure-line breeding. The breeding problem in rye is that of corn in most details.

The first of this rye was planted at M. A. C. (East Lansing), in the fall of 1909. The Michigan Experiment Station was not long in observing the vast superiority of Rosen Rye over all others, and since it has been introduced among farmers, several have reported yields over fifty bushels per acre.

Developing and maintaining a pure strain of rye is one of the most difficut problems of a plant breeder, for rye, unlike most of the other cereals, such as wheat, oats and barley, cross fertilizes—resembling corn in this characteristic. The Danish people grow their pure seed on an island off the mainland. If we expect to keep our Rosen Rye pure we should grow it a quarter of a mile from common rye.

Rosen Rye was selected and improved from an envelope of Russian Rye, furnished in 1909 by Mr. Rosen, a student from Russia at the Michigan Agricultural College. This variety immediately began to show its outstanding superiority, and after proving its ability to double the yields obtainable with any other variety, it was distributed in a number of counties, and, where kept pure, is continuing to maintain the record established on the Experiment Station plants.

In 1912 a bushel of Rosen Rye was sent to Mr. Carlton Horton of Albion. This was sown on an acre and produced 35 bushels of rye of such quality that not only that crop but those of following years have been used entirely for seed. Now we find 2,000 acres growing in Jackson County, and 3,500 acres in St. Joseph County, with a total for the state of about 15,000 acres.

Unfortunately, due to ordinary threshing practices and the growing of common rye in adjoining fields, only about 5 per cent of this acreage is 99 per cent pure. The other 95 per cent has

[1] A part of this report appeared in the *Extension Series*, published by the Michigan Agricultural College, July, 1917.

ROZEN RYE, GOOD AND BAD

The two heads in the center show a side and edge view of Rosen Rye. The two heads at the left show an edge and side view of common rye. The two heads at the right represent what is known by the inspectors as the off-type. This shows the large kernels of the Rosen and the poor filling of the common. This type results from a cross. (Fig. 15.)

been more or less crossed, and though it is increasing yields five to ten bushels per acre and should be used in preference to common rye, yet it cannot be considered equivalent to pure Rosen Rye.

The farmer who grows common rye knows that fifteen bushels per acre is all he can expect in an average year, with twenty bushels per acre as an exceptionally good yield. Yet the farmers who have had experience with pure Rosen Rye will agree that twenty bushels is a low yield for the variety, and that forty to forty-five bushels per acre yields are not uncommon.

Rye does not belong on every farm, but it is particularly adapted to large areas of the lighter soils of this state. To prevent washing and leaching, these soils should not be permitted to go through the fall and winter without a growing crop of some kind. In nearly every case, the thirty-five to forty-bushel yields of Rosen Rye have been obtained from fields sown during the first half of September. While it is far from our desire to advocate late sowing of rye, yet this crop can be used to advantage on thousands of Michigan acres to follow crops of corn and beans.

Now that Rosen Rye has asserted its superiority in nearly every rye-producing section and will yield over 300,000 bushels in the state during 1917, it should largely supplant all other varieties after that date, for ordinarily Michigan grows about 300,000 acres of rye; but this year (1917) there will probably be twice or thrice that acreage sown. If this occurs, many will be unable to get even Rosen Rye that is somewhat mixed, but by next year (1918) Michigan will not only be the leading rye-producing state, but she will double the four and a half million yield

A NEW BREED OF RYE. FARMERS COOPERATE WITH SCIENTISTS

Upper photograph shows a field of Rosen Rye. Note the larger heads on shorter straw than is ordinary in common varieties.
Lower photograph: Mr. J. W. Nicolson, Secretary, Michigan Crop Improvement Association, inspecting farmers' grain samples. The farmers, whose fields pass inspection, send a sample and promise the rest of the seed sold under the Association shall be up to this standard. (Fig. 16.)

now credited her, largely through the use of the variety Rosen Rye.

However, we should not neglect all the other factors which enter into the production of a good crop of rye, such as proper use of manure, acid phosphate, and thorough preparation of the seed-bed. For a maximum crop of Rosen Rye, seeding should be done the first half of September at the rate of four to five pecks per acre. October seeding should be made at the rate of six pecks per acre.

Realizing the value of the variety and the necessity for high standards of purity and freedom from weeds, the Michigan Crop Improvement Association has introduced an inspection of this and other pedigreed grains. Any farmer can become a member of this association on payment of the annual dues of one dollar, but in order to sell his grain under the trademark of the association, he must submit it to inspection by its agents and pay all attendant costs. The requirements to pass inspection include a clause demanding 99% purity of variety, freedom from quack grass, mustard and dodder, and not to exceed one-half of 1% weed seeds. To sum it up, inspected Rosen Rye must be good, pure, and thoroughly recleaned seed.

Lists of growers whose Rosen Rye has passed field inspection will be available August 1, 1917, and can be secured on request from J. W. Nicolson, Secretary of Michigan Crop Improvement Association. On receipt of this list, a prospective buyer can get in touch with producers of Rosen Rye.

Further Evidence that "Like Marries Like"

Donald M. Marvin has published in the September number of the *Publications of the American Statistical Association* some new facts confirming the theory that "like tends to mate with like." His chief conclusions are here quoted:

"The presence of a large and increasing number of women in industry raises the question of the possible influence of industry upon marriage selection. Modern social conventions are based upon the presumption that woman is shut away in the home and that man must follow her there if he wishes to see her. In entering industry in such large numbers, women face two new conditions, one negative, the other positive. They leave the home temporarily empty and they create a new social phenomenon of occupational propinquity. This, modified by the various influences of class stratification, financial status, and other forms of group cohesion involved in the present organization of society, tends to differentiate certain groups of men and women for marriage.

"Industrial propinquity extends to the home and to the economic status. Even class and race lines enforce occupational cohesion. Such stratification and drawing together of certain parts of social groups must react variously upon those involved. It seems possible that friends who marry within their own occupation are not so much guided by similar tastes and backgrounds as they are driven by a new force of industrial propinquity, a force that has developed with the appearance of woman in industry.

"Marriage, a matter of individual choice, if choice exists, obeys the sweeping silent force of propinquity. Women in each occupation are surrounded by the men of the same occupation. Of course they marry these men. This inevitable sequence causes no astonishment.

"Today the most attractive as well as the strongest and most vigorous women are in industry. Their presence has been accepted and the taboo has been removed. The result is that men are now marrying the women whom they meet in their work. The tremendous proportions of this movement are of startling and far-reaching significance.

"The data were derived from the

books of the Marriage License Bureau in City Hall in Philadelphia. All licenses in the available books were used. They include practically all licenses issued in Philadelphia for the three years from June, 1913 to June, 1916. The numbers run from 299,758 to 322,586 and from 332,601 to 340,900 and from 341,401 to 355,367.

"The grouping of occupations of the United States Census was used in a preliminary study of a thousand cases. Of these thousand cases 541 women worked and of these 275, more than half, married men in the same occupation. Of the thousand men more than 25% married into their own occupation.

"If a girl enters a profession, there is one probability in four that she will marry a professional man and small likelihood that she will marry into manufacturing. Ability to predict the occupation of the man whom a woman will marry may well be regarded as belonging in the realm of clairvoyance. Yet, while it will always be impossible to prophesy for an individual woman, for a group of women such prediction is not only easy but extremely accurate.

"A supplementary investigation was made of statistics of Bryn Mawr alumnae. It was found that about 90% of the married alumnae had married college graduates. More than 60% of them married men in professions.

"Where men and women are employed together in like positions, each profession or specialized occupation is the natural breeding place for people of the type of ability required. This situation must be recognized both by those who believe in heredity and by those who favor environment. Sex propinquity in modern industry seems destined to affect the matings and through the matings, the type of the coming generations."

League for Constructive Immigration Legislation

The fundamental principles of the proposed League for Constructive Immigration Legislation will doubtless be of interest to all patriotic Americans, and especially to believers in the importance of heredity and consequently in the inborn nature of important racial differences. The following suggestions have been received from Mr. Gulick:

The United States should so regulate, and where necessary, restrict immigration as to provide that only so many immigrants of each race or people may be admitted as can be wholesomely Americanized.

The number of those individuals of each race or people already in the United States *who have become Americanized* affords the best basis of the measure for the further immigration of that people.

American standards of living should be protected from the dangerous economic competition of immigrants whether from Europe or from Asia.

Such provisions for the care of aliens residing among us should be made as will promote their rapid and genuine Americanization and thus maintain intact our democratic institutions and national unity.

The Federal Government should be empowered by Congress to protect the lives and property of aliens.

All legislation dealing with immigration and with resident aliens should be based on justice and good will as well as on economic and political considerations.

Under suitable provisions and rigid limitations as to numbers and qualifications, naturalization should be given to all who qualify, regardless of race.

Correspondence on the part of those who approve these principles is cordially invited.

SIDNEY L. GULICK, *Secretary*,
105 East 22d Street, New York City.

HEREDITY OF TUMORS OF THE NERVES

Another Alleged Mendelian Dominant in Man

DR. SAMUEL A. PREISER of Montefiore Home and Hospital, New York, and Dr. Charles B. Davenport of Cold Spring Harbor, N. Y., have published in the *American Journal of Medical Sciences*, for October, 1918, some evidence, interpreted by them to mean that the rare disease, known as multiple neurofibromatosis (von Recklinghausen's disease), is inherited as a Mendelian dominant.

"Among the rarest of abnormal conditions of the surface of the body is that characterized by a large number of sessile or pedunculated swellings or tumors, sometimes soft and elastic, sometimes firm and tough, that vary in size from that of a millet-seed to that of a child's head. The skin over the tumors is frequently discolored, brownish or bluish, or redish through enlarged capillaries. They may be present from birth and they may tend to grow, usually very slowly, but they rarely, if ever, regress in size. Examination shows that they are fibrous tumors, frequently containing one or more nerve fibers; or, when more deep-seated, being enlargements of the perineurium of the nerve trunks. They are due to localized cell proliferation of the connective-tissue sheaths of the nerves.

"The number of these nodules varies with age and constitution of the individual. They tend to increase in number, as well as in size, with age. At one extreme there may be only a solitary growth upon one nerve, at the other the number is very great. Thus, Robert Smith (1849) counted 450 on one limb and over 2,000 on the whole body. Octerlong (1875) counted 2,333 tumors on a negress of sixty-six years and the count did not include some of the smaller ones. But the record of patience in counting seems to be held by Hashimoto (1890), who made out 4,503 tumors on the skin of a middle-aged Japanese man.

"Multiple neurofibromatosis is a rare condition, as it is found in only about 1 in 2,000 cases that present themselves to medical clinics or private practitioners for skin diseases. No doubt there are many abortive cases which never get into the literature, but, even so, the proportion of the population which has the classical symptoms of neurofibromatosis is very small. Despite this there are many cases in the literature of two to six members of a family — blood relatives — who show some of the symptoms. The frequent concurrence of these relatively rare symptoms in several members of one family cannot be accidental. It must be due either to the presence in the family of internal factors tending to induce the symptoms or to external agencies (such as contamination, germinal infection) which act upon individuals (like those of a family) who are in intimate contact. The fact that only *blood* relatives are affected speaks strongly against the contact hypothesis. The possibility of an infection through the germ cells cannot be denied. It is to be noted, however, that father and child are quite as often affected in the same way as mother and child. This proves that the tumors do not belong to the class of diseases that are induced merely by infection through the placenta.

"Though so many cases are on record of more than one affected person in a family, it is not to be overlooked that in very many reports no mention is made of relatives who have similar symptoms with the patient; also, there are a number of cases in which the existence of affected relatives was denied.

"An apparent difficulty in the way of the hypothesis that multiple neurofibromatosis is a dominant trait seems to lie

in the fact that breaks in generations actually do occur. That 'no family history' of a direct ancestor is obtained in response to the usual superficial inquiries made by the practitioner of hospital cases is not surprising; the fact that a disease like his own occurs in other members of the family is apt to be denied (if indeed recalled) by the patient under the stressful conditions of the examination; the patient often exhibits the reactions of the malingerer. In a few histories like that of Fig. 29, II, 2 [see full report; this, by the way, is a case of elephantiosis], it seems probable that a generation is actually skipped. This is by no means fatal to the view that the disease depends upon a dominant trait, for a precisely similar result is obtained in experimental breeding of clear dominant traits, *e. g.*, in polydactylism of fowl. Occasionally a dominant trait simply fails of expression in an individual who carries it."

The evidence that multiple neurofibromatosis is due to heredity is very convincing and it appears to be clear that it is associated with a segregation in the gametes, but the authors have failed to furnish proof for their theory that it behaves as a Mendelian dominant.

That same form of heredity is a cause of the disease is made evident chiefly by the fact that it is so very rare and at the same time cases occur so frequently grouped in the same families.

Chronic renal troubles and cancer may be just as much determined by faulty germ-plasm, as brachydactylism or night blindness, but the two latter conditions are so unusual that their appearance in several members of the same family is at once noticed, and properly ascribed to heredity. Multiple neurofibromatosis is also an extremely rare disease. The authors find 243 persons described in the literature of the subject. One hundred and fifty-eight cases show one parent similarly affected. In thirty-four cases neither parent is recorded as affected. This leaves fifty-one cases which were left out by the authors in their "families charted." Just how these surplus cases are dealt with is not made clear, but it is not very important as far as making certain the fact that the disease is due in most instances, if not in all, to some quality conveyed by the chromosomes. Even if there be only 158 cases out of 243 who are the direct descendants of others similarly affected, it is over 65%, and this, it must be remembered, is very high, considering the rarity of the ailment. Probably in the cases of neurofibromatosis many of the remaining 35% can be accounted for by lack of complete family data, that would show reversion to germ-plasm carried in the stock. Others may be new mutations. Further evidence must be produced that this curious disease does not often skip a generation, if it is to be included among the comparatively few cases of undoubted Mendelian dominance in man.

Sheep-Killing Habit Among Dogs Incurable and Infectious[1]

"The continued high prices of mutton and lamb have made it desirable that more sheep be kept on the farms of the United States. The excessive area of rough pasture land, weedy lots, and grown-up fence rows affords an excellent opportunity for feeding sheep, which should be used in cleaning up and maintaining the productivity of all such lands. Compared with the United Kingdom, where there is one sheep or lamb for each 2.5 acres of the total land area, in the 37 farm states of the United Sates, not included in the western division, there is only one sheep or lamp for each 31.8 acres

[1] Condensed from *Farmer's Bulletin 652*, Bureau of Animal Industry, U. S. Department of Agriculture.

THE WORK OF TWO DOGS IN A SINGLE NIGHT

Photograph shows fifty sheep killed by two dogs, during the night of February 8, 1917, in Beaver County, Penna. These sheep were valued at $1,000. Thirty-eight were ewes with lamb. Only four of the flock escaped. These were badly mangled. Photo by E. W. Brown, Beaver, Pa. (Fig. 17.)

of land in farms. The British farmer handles his land on an intensive farming basis, and forage-crop pasturages have been highly developed. In that country the special advantage of this system of pasturage for sheep is generally recognized.

"Forage-crop pastures not only augment intensified farming and increase the fertility of the land, but also free the sheep from many internal parasites contracted through grazing upon permanent pastures. Of such parasites stomach worms are most prevalent and disastrous with young stock. Methods of preventing infection through the use of a succession of forage-crop pastures are understood and successfully followed by many farmers. In flocks handled under such conditions lambs born in the late winter or early spring are kept free from infection and finished for the market by the latter part of June or the 1st of July, at which time market prices are generally highest. It is essential that the American farmer recognize the small flock of sheep, handled under forage-crop conditions, as a factor in the economic handling of high-priced farm lands.

"As compared with the census of 1900, that of 1910 shows an increased valuation of 20%, or approximately $19,000,000, in the total value of sheep in the United States, exclusive of the western division. Notwithstanding this marked increase in value, there was a decrease in numbers of 14%, or over 3,900,000 head, for the same period of time. It seems that an industry so favored by market conditions and so well adapted to the area in question should flourish rather than decline.

DOGS THE DIFFICULTY

"Sheep-killing dogs are not only recognized as the worst enemy of eastern flockmasters at the present time, but are known to be the principal cause of so marked a decrease in the numbers of sheep kept on farms. The moral effect upon all persons who have seen sheep killed, injured, or frightened by dogs is far more destructive to the industry than the actual damage sustained. No farmer contemplating the raising of sheep is likely to venture on the enterprise while the flocks of his neighbors are continually meeting reverses through the attacks of dogs, as the ultimate financial losses following such reverses are incalculable. Dog depredations to flocks are not only disheartening and discouraging to the flockmaster, but they also break up breeding plans and render flocks restless and non-productive.

USUALLY WORK IN GROUPS

"Sheep-killing dogs work both singly and in groups, but usually in twos or threes. They do not limit their attacks to the flocks of the immediate vicinity in which they are kept, but travel for miles in all directions, spreading destruction in the flocks with which they come in contact. Because their work is so often done under the cover of darkness it is almost impossible to catch them in the act of worrying the sheep, and hence they can seldom be positively identified.

"The ways in which different dogs attack and destroy sheep vary greatly. Some dogs simply kill one or two sheep in a flock, while others continue the attack until all the sheep are either destroyed or crippled. In many cases where large numbers are killed they are neither bitten nor wounded, but simply chased until they die from exhaustion.

"After a dog has once formed the habit of killing sheep, it seemingly becomes a mania with him, and he is seldom, if ever, broken of it. He not only destroys sheep himself, but leads other dogs to the work. No consideration should be given such dogs; if additional losses to flocks from this source are to be avoided, they should be dispatched as soon as their habits are known."—V. O. McWhorter, *Animal Husbandry Division, U. S. Department of Agriculture.*

APPENDIX

Variability in the Radish

(*See article on page 357*)

TABLE I.—*Comparison of Variability in Characters*

	Scarlet Globe	White Box	White Icicle
Weight (in grams)			
Mode	10.5	3.8	30.5
Modal coefficient	17.00%	18.35%	12.31%
Mean	12.58 ± .3192	17.22 ± .5044	47.59 ± 1.392
Standard deviation	6.285 ± .2243	11.49 ± .3573	26.34 ± 1.023
Coefficient of variability	49.15% ± 2.34%	66.7% ± 2.850%	55.34% ± .882%
Length (in millimeters)			
Mode	35.5 and 29.5	30.50	112.
Modal coefficient	13.00% and 16.75%	13.56%	13.40%
Mean	34.488 ± .4378	29.42 ± .326	124.55 ± 1.393
Standard deviation	8.62 ± .3077	7.43 ± .231	34.22 ± 1.023
Coefficient of variability	25.00% ± .9978%	25.25% ± .834%	27.55% ± 1.952
Thickness (in millimeters)			
Mode	29.50	38.50	29.
Modal coefficient	15.00%	11.02%	19.56%
Mean	27.295 ± .319	31.53 ± .417	54.35 ± .279
Standard deviation	6.279 ± .224	9.50 ± .295	6.86 ± .205
Coefficient of variability	23.00% ± .904%	30.13% ± 1.019%	12.62% ± .383%
Index of shape (length divided by width)			
Mode	1.02	.86	4.32
Modal coefficient	21.00%	27.65%	15.94%
Mean	1.354 ± .062	.97 ± .009	4.25 ± .046
Standard deviation	1.223 ± .044	.213 ± .007	1.129 ± .034
Coefficient of variability	90.39% ± 5.27%	21.96% ± .715%	26.55% ± .853%

TABLE II.—*Correlation of Weight with Length and Thickness*

	Scarlet Globe	White Box	White Icicle
Weight with length	.6506 ± .0215	.8258 ± .0140	.8840 ± .0378
Weight with width	.8810 ± .0394	.9013 ± .0083	.8740 ± .0311

Genetics Literature

THE annual reports of the AMERICAN BREEDERS' ASSOCIATION, published in seven volumes, form the most valuable collection of material for students of genetics which has been published in the United States. Most of them are out of print and are becoming expensive. All of them are nearly indispensable to libraries, institutions and students of plant and animal breeding, heredity, variation, eugenics, or genetics in general.

The Association still has on hand a limited number of copies of three of these reports, which it offers for sale.

Vol. VI, Proceedings A. B. A. (1910), contains 465 pages. Illustrated. It includes 80 papers on general genetic subjects, and among the contributors are practically all the leaders in this study in the United States. **Issued at $2, now offered for $1.**

Vol. VII, Proceedings A. B. A. (1911), and Vol. VIII (1912), bound in one volume of 593 pages, illustrated, and including 73 papers on the most vital and interesting features of genetics. **Issued at $3, now offered for $1.50.**

The volumes are substantially bound in cloth and will be sent post-paid on receipt of price.

As the Association frequently receives requests for other volumes of the proceedings, which are now out of print, it will be glad to hear from those who have copies for sale or exchange.

In addition to its annual reports, the Association still has on hand a few copies of the following issues of the AMERICAN BREEDERS' MAGAZINE:

Vol. I, Nos. 2 and 4.
Vol. II, Nos. 3 and 4.
Vol. III, No. 2.
Vol. IV, Nos. 1 and 4.

JOURNAL OF HEREDITY:

Vol. V, Nos. 5, 6, 8, 9, 10, 11 and 12.
Vol. VI, Nos. 2, 3, 7, 9, 11 and 12.
Vol. VII, Nos. 5, 6, 7, 8, 9, 10, 11 and 12.
Vol. VIII, Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12.

Each of these issues contains numerous articles on plant and animal breeding and eugenics, written by specialists and in most cases describing the results of their own researches. In many instances these researches have never been described elsewhere. These numbers will be sold for 25 cents each, post paid.

Address

THE AMERICAN GENETIC ASSOCIATION

511 Eleventh Street Northwest **WASHINGTON, D. C.**

WHAT GENETICS IS

"An exact determination of the laws of heredity," says William Bateson, "will probably work more change in man's outlook on the world, and in his power over nature, than any other advance in natural knowledge that can be clearly foreseen."

To gain this knowledge is the object of the science of genetics, which proceeds, in practice, largely by means of plant breeding and animal breeding for the reason that heredity is less complicated in these organisms than in Man, and its operation can be more easily made out. The knowledge so gained finds its application in methods for the improvement of cultivated plants and domesticated animals and, most important of all, in the improvement of the human race through the science of eugenics, which was defined by its founder, Francis Galton, as "the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally."

THE AMERICAN GENETIC ASSOCIATION

is an incorporated organization, coöperative in nature. It is devoted to promoting a knowledge of the laws of heredity and their application to the improvement of plants, animals, and human racial stocks.

It owns the JOURNAL OF HEREDITY, which is published monthly and sent free to each member.

REQUIREMENTS FOR MEMBERSHIP

Membership is composed of men of science, teachers, publicists, physicians, clergymen, parents, students, horticulturists and breeders of live stock, etc., throughout the world.

Subject to the approval of the council, any person interested in the improvement of the human race or the creation of better varieties of plants and animals, is eligible for membership.

The secretary will be glad to correspond with those interested, and to send a copy of the magazine for examination.

Annual dues, giving the right to attend all meetings and receive the JOURNAL OF HEREDITY, are $2; life membership is $50.

If you want to become a member, or if you know anyone who you think is eligible for membership, write to

THE AMERICAN GENETIC ASSOCIATION

P. O. Box No. 472, Eleventh Street Station Washington, D. C., U. S. A.